The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XL. March 25, 1939 No. 1,030

Dangerous Industrial Gases and Vapours

THE subject of toxic gases in industry is very much to the fore just now. Some time ago the D.S.I.R., with the co-operation of the A.B.C.M., arranged for a series of tests to be developed for the detection of poisonous gases produced in industrial processes and the fifth report of the series has just been issued. On March 14 the Institute of Petroleum held a symposium on the general subject of "Dangerous Gases in the Petroleum and Allied Industries." It was remarked in one of the papers that although in the conference emphasis was placed on petroleum, "it will be obvious that many other industries have similar problems which can and are being solved in an analogous manner. Chemical plants handling volatile solvents, gas companies, and others have joined the ranks of those who believe that there is no justification in guessing."

Most of the papers dealt with the fire hazard, and in particular with the handling of explosive mixtures occurring in tanks used for the storage of volatile inflammable liquids. A comprehensive survey was given of methods for the detection of such mixtures which involve generally the rapid determination of the quantity of inflammable gas present without the need for performing detailed chemical analysis or even of knowing anything about the composition of the vapours present. These indicators serve to disclose the presence of gas, or to demonstrate the substantial absence of gas, and to measure the change in concentration which accompanies a given operation. One such method is the use of two similar platinum filaments heated by the same current, one being exposed to the gas to be tested, and the other shielded from it by pure air, the difference in brightness, or the electrical resistance being measured.

It is necessary to know the inflammable limits of the vapours being handled. Generally, when a tank is filled with inflammable liquid the vapour space above the liquid is too rich in vapour to be explosive; and when the tank is emptied two things may happen. With a very slow rate of emptying, the incoming air and existing vapour may mix and an explosive mixture be always present; or with normal rates of emptying, the air first divides into three layers, the lower one against the liquid being too rich to ignite, the next being explosive, and the upper one too weak to ignite. On standing a few hours the whole usually becomes explosive and when the tank is blown out with air, or when it is refilled, an explosive mixture issues from the vents. The correct procedure for preparing a tank for entering, as agreed by petroleum authorities at this conference, seems to be to ventilate first and to hose down the sides afterwards. Ventilation may be effected by steaming or by blowing in compressed air, or if steam and compressed air are not available, by opening a man-hole at the top and bottom and leaving the tank a day for natural ventilation to do its part. The atmosphere must always be tested before entering. Attention is called to the dangers of pockets of liquid being retained in the tank, e.g., by leaky steam coils, or even in hollow ladder rails.

An important suggestion is the purging of tanks with flue gases. This is used by the Standard Oil Co. of California on their tankers, and is coming into use in the gas industry for holders in this country. The principle of the method depends on the fact that when the oxygen content of the atmosphere is reduced progressively, the inflammable limits of the vapour approach and ultimately—with petroleum vapours at 12 per cent. oxygen—coincide so that inflammation cannot take place. When the atmosphere of the tank is initially explosive, the method does not seem to have much advantage over air or steam purging; but where the concentration of vapour is above the explosive limit flue gas purging has obvious advantages. The flue gas is washed and cooled before use. The use of flame arrestors is also recommended when explosive mixtures can form in pipes, details being given of a simple form packed with coarse gravel to absorb the heat of the reacting gases. This form will not arrest an explosion necessarily unless explosion breaking flanges are placed in the circuit in such a position that the flanges are at right angles to the oncoming explosion wave. The use of flame-proof apparatus as developed for the coal mining and other industries may also be important.

An interesting point is the possibility of gas development by micro-organisms. The generation of hydrogen sulphide by the action of sulphur bacteria is already well known, but there has been found some evidence at the Chemical Research Laboratory that nitrate-reducing bacteria can live below a kerosine layer and can generate a gas containing 10½ per cent. of methane and 4 per cent. of ethane.

Industrial development during recent years has brought about a large increase in the production, storage and handling of materials of an inflammable nature. . . . . Precautionary methods have had to be developed to a degree hitherto either unnecessary or unrecognised, with the object of maintaining the safety of personnel and plant against dangers introduced. . . . .

—H. Lloyd.

NOTES AND COMMENTS

Proposed Memorial to the late Professor Henry E. Armstrong

WE publish on another page a letter we have received from Sir Arnold Wilson announcing the proposal to establish a Trust Fund to the memory of the late Professor Henry E. Armstrong. A committee has been formed, of which Sir Arnold is chairman, of representatives of the many interests with which Professor Armstrong was associated and it has been decided that the income of a Trust Fund should be devoted to the publication or preparation of works within the ambit of Professor Armstrong's recognised interests, in addition to providing some form of permanent memorial at the City and Guilds College and perhaps replicas elsewhere. Any works published will bear a portrait and biographical notice of Professor Armstrong, and a reference to the Trust. It is hoped in this way to provide the general public, at a moderate price and in language generally understood, with an account of new work which would not otherwise be available to them. This is certainly an object which Professor Armstrong himself would have considered most worthy and many will be sincerely grateful of being given the opportunity which the Trust Fund affords, of paying tribute in such a fitting way to the memory of a great personality which they held in high admiration and respect.

Tax on Redundant Plant

MANY businesses find it necessary to instal additional plant and machinery in order to cope with an increase in orders of only a temporary character. This may involve considerable financial outlay, although this plant is surplus to normal requirements. When normal conditions return, the plant may not be obsolescent but its redundancy involves losses. Under present law the tax authorities may treat these as capital losses. In a representation made by the Association of British Chambers of Commerce to the Chancellor of the Exchequer, it was pointed out that these losses should properly be chargeable against the profits made while the plant was in operation. It was therefore urged that the annual allowance in respect of plant and machinery should be substantially increased to cover not only wear and tear but obsolescence and that the requirements as to replacement should be abolished as a condition of allowance for obsolete or redundant plant and machinery. It was further urged that the wear and tear and obsolescence allowances should be extended to include factories and buildings.

British Commercial Soundness

POLITICIANS all over the world may be nerve racked, but the British business man still contrives to keep calm. It is extremely hard on him and on the workpeople he employs that his peaceful and fruitful efforts should have been subject to grave stress twice in six months because of events outside his control. The present commotion came out of a blue sky. The shock to confidence caused by the September crisis had largely worn off. Judged by the usual indices, trade and employment were both improving. The prospects were even bright for the export trade, with the successful conclusion of the Anglo-American negotiations and the prospective visit of trade missions to Germany and Eastern Europe. This was the moment chosen by a foreign politician to throw another spanner into the machinery. Nobody can have any difficulty in picturing the worst results of Herr Hitler's shameful aggression against the Czecho-Slovak Republic. At the best, he has created an atmosphere in which the commercial structure has to be laboriously buttressed afresh. The past week has been a severe test of the courage and common sense of the British commercial and industrial classes. It would appear from the available evidence that such "jitters" as have been displayed have been on a considerably smaller scale than at the time of Berchtesgaden and Munich. This does not imply any lack of resolution in this country to take up the final challenge of the aggressor if it is ever hurled in our direction. The exact contrary is the case. It is the very knowledge of the strength of the British case and of the power with which it can be supported in an emergency which has enabled the British business man to stick grimly to his task. That, at the moment, is simply to get on with his peace-time job and give re-assurance to all about him. The chief asset which British negotiators enjoy is the commercial soundness of the country. Without it re-armament would be a sham and the assertion of prestige a mockery.

Industrial Leaders' Heavy Responsibility

NO heavier responsibility has ever fallen upon leaders of British industry than that confronting them today. They are taxing themselves up to the hilt, while giving loyal support to the Government in an unparalleled effort and studying the safety of millions of workpeople now and in the future. This calm resolution is an object lesson to the world of which Great Britain is entitled to be proud. If the industrial leaders show no trace of panic they are rendering the best possible service to Ministers harassed by baffling events. To sneer at the familiar slogan, " Business as Usual," is simply stupid in the position in which we now find ourselves. Business as usual is exactly what the politicians are most in need of. Anything approaching a collapse of trade and employment in this country would give the worst possible impression abroad, and would be merely handing out an argument to those who falsely proclaim the decadence of the British race. Until the political issues have been resolved, it is a case of sticking to one's post and, if possible, keeping the industrial flag flying more bravely than ever.

Overseas Trade in February

THE Board of Trade returns show that the value of United Kingdom exports last month did not only follow the recent trend of slowing up the fall on the previous year's figures, but in fact registered a gain on the corresponding month of 1938. Another most encouraging feature was the fact that imports continued to decline and, at £65½ millions, were the lowest monthly figure since February, 1936, thus giving a further substantial reduction in the adverse trade balance. Exports of chemicals, drugs, dyes and colours rose in value by £18,773 to £1,688,312 compared with the corresponding month last year (at the same time they are £327,197 down on February, 1937), and imports rose by £204,022 to £1,126,177. It is particularly galling that a fresh disturbance in the business world should have occurred at a time when overseas trade was in a more healthy condition than for months past.

The Detection of Inflammable Gases in the Petroleum and Allied Industries

Institute of Petroleum Symposium

A symposium was held by the Institute of Petroleum on March 14 on "Dangerous Gases in the Petroleum and Allied Industries." Fifteen papers were contributed to the symposium and we publish below extracts from four of the papers dealing with the detection of inflammable gases and flame arrestors. These subjects are of particular interest to several branches of the chemical industry.

Vapour Detectors in the Petroleum Industry

By P. Docksey

VAPOUR detectors are used in the petroleum industry for the purposes of guarding against the risk of fire and explosion, and of ensuring that an atmosphere is non-toxic. While the first requirement may be defined with sufficient accuracy by the lower explosive limit of the vapour, the second is subject to no strict definition. In fact the toxic effect may in many cases be due, not to the hydrocarbon content of the atmosphere, but to traces of more potent compounds, e.g., sulphur compounds associated with it. It is customary to regard a tank as gas free if the hydrocarbon content of the air is one-fifth of the lower explosive limit, and it is desirable that some indication should be given by a quarter of this concentration, i.e., 5 per cent. of the lower explosive limit. A suitable instrument for the purpose therefore has a scale ranging from zero to something over the lower explosive limit, with ability to respond with certainty to a concentration as low as 5 per cent. of this.

A further requirement of such instruments in the petroleum industry is that they should measure concentrations of vapours of widely varying, and usually unknown, molecular weights ranging from methane upwards. It is important that a detector of a new type, and particularly one working on a not very clearly defined principle, should be tested in mixtures of several gases.

The lower explosive limit in air, when expressed as a percentage by weight, is approximately constant for the complete range of hydrocarbon vapours. Thus, a detector which gives the same response for equal percentages by weight of vapour whatever the molecular weight, will give approximately the same response at the lower explosive limit whatever the vapour in the mixture being tested.

Basic Principles of Detectors

A considerable number of detectors for hydrocarbon gases have been proposed. They are based for the most part on a few well-defined chemical or physical principles and differ merely in the method of application. The principles most commonly used as a basis are :—

(1) *Chemical.*

The gas mixture is passed through a heated tube in order to burn the hydrocarbon, and the amount of carbon dioxide formed is estimated by passing the products through lime water. The amount of precipitate can conveniently be estimated from the turbidity of the lime water. (Seaber, *Industrial Chemist,* August, 1927).

Such a method as this is not rapid, but it can be made accurate. The limit of accuracy lies in the variation in the CO_2 content of the air, which in a refinery or works may be considerable. A blank experiment overcomes this difficulty but considerably increases the time for a test. It is evident that the correct figure for the percentage by weight or by volume of the hydrocarbon vapour present can only be obtained if the chemical formula of the vapour is known. However, if the formula is unknown, the percentage of inflammable vapour by weight may be estimated within ±10 per cent. Thus, in this respect the chemical type meets the requirements of a good meter. It is, however, too slow in use to be generally adopted in a refinery.

(2) *Diffusion.*

Methane detectors working on the principle of diffusion are well known. Since, however, they depend essentially on the difference between the molecular weights of air and the combustible gas they are quite unsuitable for dealing with the wide range of molecular weights encountered with petroleum.

A second type of detector depends on the pressure difference across a porous membrane due to the diffusion of the products of combustion of the gas (Ringrose detector). Such a detector works well for methane mixtures, but cannot be made sufficiently sensitive for mixtures containing hydrocarbons of higher molecular weights, e.g., pentane. It gives approximately equal response to equal percentages by volume.

Measuring the Volume Change on Combustion

(3) *Volume Changes on Combustion.*

If a gas-air mixture is enclosed in a chamber and burnt on a red hot filament, and is subsequently allowed to cool to its original temperature there will be a decrease in pressure due to the condensation of the water formed during combustion. The decrease in pressure can be used as a measure of the concentration of the mixture. The McLuckie detector operates on this principle. It consists of two copper chambers one of which contains the filament. A barrel-tap, actuated by a handle on the side of the case may be set in one of three positions. In the first position both chambers are connected to air and may be filled with a representative sample for test by sucking air in with a small hand pump. In the second position both chambers are completely sealed, while in the third position the chambers are opened to the opposite sides of a small water manometer. The combustion is carried out with the tap in position (2). After allowing the gas to cool the tap is turned to position (3) and the amount of inflammable vapour read on the scale of the differential manometer.

This detector gives a discontinuous reading, but can be used if desired to test a small sample of gas, e.g., 500 ml. The time taken for a test is about ten minutes. It can be made sufficiently sensitive and repeatable to meet the requirements laid down in the introduction, and it combines with this a considerable degree of ruggedness owing to the simple principle on which it works.

The weak point is that the detector does not measure percentages either by volume or by weight except, of course, for the particular gas or vapour for which it is calibrated.

Measuring the Heat of Combustion

(4) *Heat of Combustion.*

The principle of assessing the amount of inflammable gas present in the air by means of the heat generated when the gas is burnt has been used for many years. Any device which measures the heat of combustion will give approximately equal responses to equal percentages by weight, irrespective of the molecular weight or chemical type of the hydrocarbon gas or vapour. The principle may be applied in practice either by burning the mixture in a flame of standard size, or on a filament usually of platinum or palladium. The well-known Redwood lamp may perhaps be considered in this category, although the heat of combustion is not directly measured.

A second example of the first type is the Spiralarm detector. A round wick burning kerosine is adjusted in gas free air to

give a flame of standard size. The flame is in a compartment fully protected by gauzes. When the lamp is placed in a gas mixture the temperature of the products of combustion rising from the flame is raised due to the extra heat of combustion in the gas mixture entrained in the flame. A bimetallic spiral strip placed above the flame responds to the temperature and closes a pair of contacts actuating a warning light if the concentration of gas rises above a certain limit. The size of the flame must occasionally be checked in gas free air, but beyond this the detector is continuous in operation.

The majority of the detectors working on the heat of combustion principle use an electrically heated platinum filament to promote combustion. Owing to catalytic action the temperature to which the filament is adjusted initially in gas free air can be quite low, but it must be raised above a certain limit for other reasons explained later. When gas-air mixture is admitted to the chamber containing the filament combustion proceeds on the filament surface and the temperature is increased proportionately to the heat of combustion available in the mixture. The increase in temperature may be estimated in various ways; for example, by colour brightness directly observed by eye (Martienssen detector) or by observing the filament through standard opaque glass screens in comparison with a filament of standard brightness.

Resistance-Type Detectors

A third method of estimating the temperature is to measure the resistance of the filament, a principle adopted in several detectors now on the market (U.C.C. detector; M.S.A. Explosimeter; J.W. detector). The measurement is made by including the filament as one arm of a Wheatstones Bridge, the other arms having fixed values. A controlling resistance is placed in series with the battery, and the current flowing through the filament can be adjusted by this. The bridge is initially balanced by adjusting the rheostat with the filament in gas-free air. When gas-air mixture is admitted to the filament the temperature and resistance rise, and the bridge is thrown out of balance, causing a deflection on the galvanometer proportional to the concentration. These resistance-type detectors are obviously somewhat delicate and complicated instruments, but have now been developed to a trustworthy and sufficiently robust state. They have a scale reading from 0 to 100 per cent. of the lower explosive limit. 5.0 per cent. of the explosive limit is easily detectable, and 20.0 per cent. measurable with an accuracy of ±2 per cent. Thus they easily meet the requirements discussed in the introduction.

There is one point in connection with this type of detector which needs watching. If the gas contains an appreciable proportion of H_2S the filament may, in certain circumstances, be poisoned and the detector give false readings. This can be avoided if the temperature at which the filament is initially adjusted in gas-free air is sufficiently high.

Detectors Measuring Other Physical Properties

(5) *Miscellaneous Methods.*

It is obvious that any physical difference between air and combustible gas can be made the basis of a method of analysis if sufficiently delicate apparatus can be devised. Thus the density or viscosity of an air-gas mixture may be used. For petroleum purposes the former has the same objections as the diffusion method mentioned above. The use of viscosity for analytical purposes would necessitate a large amount of work in calibrating, since there is no simple mixing law for the viscosities of gaseous mixtures. Moreover, owing to the small amount of gas which must be detected, both methods would require a great deal of experimental skill and would be correspondingly time consuming.

A further method is to use the difference in the refractive index of vapour and air as the basis. In this case extreme delicacy of measurement is obtainable by using an interferometer. Unfortunately, no figures are available for the refractive indices of hydrocarbon gases and vapours, so that it is impossible to estimate the accuracy obtainable by such a method, nor how it would respond to gases of various molecular weights. It is possible to calculate refractive indices for gases and vapours though not with a high degree of certainty. From such calculated figures it appears that the sensitivity of this method will decrease with increase of molecular weight, and that the readings on the interferometer could not be converted to percentage by weight of inflammable vapour without a knowledge of the molecular weight of the particular vapour present.

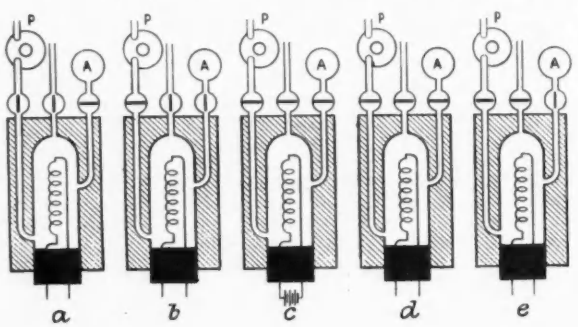
An Automatic Recorder for Inflammable Gases

By H. Lloyd, M.Eng., Ph.D., A.M.I.E.E.

SEVERAL years ago the Safety in Mines Research Board was asked to try to produce an instrument which would record continuously and automatically the percentage of firedamp in the air in its neighbourhood. An ability to give indications down to as low as about 0.1 per cent., with a range extending up to 3 per cent., were among the requirements which had to be fulfilled. Of the many possible methods which were studied, the only ones which seemed likely to be of practical value were those depending on the combustion of the methane. It is on this principle that the S.M.R.B. firedamp recorder works, and it is for this reason that it is capable of being applied also to the recording of other inflammable gases or vapours.

The principle of the combustion method of estimation, as applied to firedamp, is briefly as follows: If a sample of air containing methane is taken, and the methane in the sample is burnt, there is a contraction in volume of the sample. In the case of methane, the percentage contraction is equal to twice the percentage of gas originally present, provided that the combustion is complete. Thus, if the sample contained 1 per cent. of methane, the contraction after burning would amount to 2 per cent. Applied to hydrocarbon gases in general, the contraction depends on the number of hydrogen atoms in the molecule, the percentage contraction, if m is the number of hydrogen atoms, being $\left[1 + \frac{m}{4}\right]$ times the percentage of gas in the sample. In the S.M.R.B. recorder the sample is maintained at constant volume, so that, instead of the contraction in volume, there is a corresponding pressure change. In the case of methane the changes are large enough, after allowing for the dead volume of the aneroid cell and of connecting tubes, to operate a sufficiently robust barograph with concentrations as low as 0.1 per cent.

The firedamp recorder carries out the processes of sampling, burning and measuring automatically, the power being derived from a small electric motor or compressed-air turbine. The figure shows diagrammatically the cycle of operations. A pipe-line is led from the point at which the air is to be sampled, and connected to the intake side of the pump, *P*, which is running continuously. The delivery side of the pump connects to the sampling-chamber, through a mechanically operated inlet valve. The chamber is also



provided with two other ports, closed with valves similar to the first mentioned, one of these being an exhaust valve, leading to atmosphere, and the other communicating by a narrow-bore tube to the aneroid cell of a barograph, *A*. The chamber consists of a thick-walled metal enclosure of about 15 c.c. capacity. Besides the three valve-controlled ports, it is provided with a screw plug which conveys insulated leads to a helix of platinum wire supported within the chamber. This wire can be heated electrically to about 1,000° C., the current being controlled by a contactor working in conjunction with the valve-gear.

The Cycle of Operations

During the first stage of the cycle, (a) Fig. 1, the inlet and exhaust valves are open, and a quantity of the air to be tested is being passed through the chamber, sweeping out the waste gases remaining in it from the previous cycle, and filling it with a fresh charge. This requires about 100 c.c. of air, the ports being so disposed as to secure the most effective scavenging. The second stage, (b), shows the inlet valve closed, and the other two valves open for a brief period to allow the contents of the chamber to recover from any slight adiabatic effects, and to assume atmospheric pressure. Stage three (c), shows all the valves closed, and the platinum wire heated to incandescence, causing any methane in the sample of air to be converted by combustion into carbon dioxide and water-vapour. During stage four (d), the contents of the chamber are cooling, the thick metal walls of the chamber acting as a large heat-sink. In the final stage (e), the valve communicating with the barograph is opened, and the resulting deflection of the pointer indicates the change in pressure, and therefore the percentage of methane which was in the sample. The deflection of the pointer is recorded on a continuously moving chart by a mechanically operated striker and an inked thread. The striking mechanism is arranged to come into operation twice during each cycle: once, as explained, in the final stage, and also at stage (b), when the pressure is atmospheric. Thus the succession of dots registered on the slowly moving chart presents a record in the form of two lines, one of which is the firedamp record, the other a straight line, corresponding to atmospheric pressure, and forming a datum line from which the methane percentages are measured.

The whole cycle occupies 6 minutes, of which 3½ minutes are allotted to the cooling stage. The cooling process is not carried to completion, as this would take too long, but it is arranged that the contents of the chamber always start to cool from the same temperature. This is ensured by using a platinum wire taking a heavy current, in order to liberate so much heat within the chamber that the heat of combustion of the methane, although variable according to the percentage present, is negligible by comparison. Thus the cooling process is consistent, from cycle to cycle, and no inaccuracy is introduced from this cause. In cases where it is desired to record the gas content more frequently than every 6 minutes, additional chambers, with valves and contactors operated from the same camshaft, are provided. With the design adopted, up to six chambers are easily accommodated without complication, and all the parts are interchangeable. It is, in fact, the practice to build these recorders with at least two chambers, the readings from them appearing successively on the chart. Agreement between them is then reasonable evidence that the instrument is working correctly.

Portable Combustible Gas Indicators in the Oil Industry

By O. W. Johnson, Ph.D.

SOME fourteen years ago, in the company with which the writer is associated (Standard Oil Co.), an increasing interest was beginning to be felt in the problems of handling combustible gases and the control of explosion hazard. An extensive survey was authorised to ascertain the conditions under which explosive mixtures may be formed in tanks holding various petroleum products. Ways and means of avoiding the presence of explosive mixtures were discussed, the effectiveness of ventilation as a preliminary step in tank-cleaning was investigated, and experiments were conducted on the ignition of gases and the extinction of flames. Repeatedly in the conduct of this work, which extended over a period of many years, the need was felt for improved methods of gas measurement.

Adaptation of the Liveing Method

What was really required was a continuous method, which would perform the analysis instantaneously, so that a sample could be drawn continuously, and any change in concentration readily followed. The answer to this seemingly insurmountable problem was found to lie in a simple adaptation of the Liveing instrument (*Phil. Mag.*, 1880, *9*, 126). Whereas his method was to compare visually the brightness of two similar platinum filaments heated by the same current, one filament being exposed to the gas to be tested and the other shielded from it by pure air, it was found possible to make this same arrangement of filaments actuate a sensitive electric meter to give indication of gas concentration.

This arrangement did not by any means represent an original discovery. The successful J-W Indicator which was finally produced, as described by Hall before the American Petroleum Institute in 1928 (Report of Ninth Annual Meeting, December 3 to 6, 1928, p. 99), was not new in principle. It did, however, bring together in workable form the basic principles previously disclosed, to produce an instrument which amply filled the then existing need, and opened up new avenues for progress.

Although a complete description of the combustible gas indicator is superfluous, a brief mention of some of the characteristics which have made it so useful will be of interest. Physically, indicators range in size from a sturdy indicator for field use, weighing a little over 6 lb., down to a small tester which can be carried in the pocket. Samples are drawn into the instrument through a hose, using a pump or rubber aspirator bulb, and the gas concentration is immediately registered directly on a meter scale.

An important feature is the indication of the quantity of gas present in terms of nearness to explosibility, without any need for knowing the kind of gas present or its volume per cent. concentration. This is made possible by the fact (observed by several workers) that for low-limit mixtures of all gases with air the heat of combustion is substantially the same, irrespective of the volume per cent. of gas present. The incandescent filament which is the active element in the indicator changes its resistance in proportion to the heat liberated, and by a proper choice of the shape and temperature of the filament, it has been found possible to bring the indication for low-limit mixtures of all common gases into approximate agreement. Minor variations become still less important as the zero concentration is approached. The indications are, in all cases, quite definite and reproducible, and may be converted to per cent. by volume of the particular gas present, by means of calibration curves, where this is desired.

Features Making for Efficient Usage

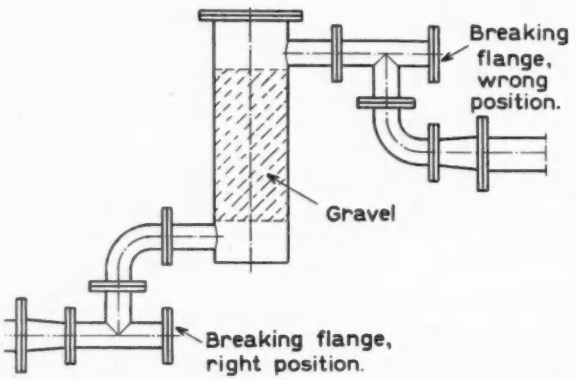
Features which tend to insure against obtaining false readings are the speed of operation, which invites repeated tests, the sensitivity and continuous sampling, which make it possible to cover all portions of a container with ease, and, in at least one model, a characteristic response when sample is being pumped which makes it impossible to mistake a failure to register for an indication of zero gas concentration.

Although the primary field of the combustible gas indicator lies in the range of low gas concentrations, it is readily possible to extend the range if desired. Air may be mixed with the sample in a predetermined ratio by means of a proportioning orifice, so that rich mixtures may be analysed. This method finds use in estimating the quantity of air present in nearly pure gases, in helping to locate gas leaks, and in kindred problems where rich mixtures are likely to be encountered.

Flame Arrestors

By H. H. Radier

THE most generally known type of flame arrestor is based on the rapid removal of the heat of combustion during the passage of the burning gases, so that they are extinguished. The systems in use are all based on the same principle: a large surface offering as much contact as possible to the gases, so that a large amount of heat can be quickly absorbed and drawn off; at the same time the aim is to keep the resistance against flow reasonably small, while the construction should be sufficiently strong mechanically. If executed in metal, a material is used having a high heat conductivity, in order to be able to keep the dimensions small. Various firms have suitable designs on the market; they consist, as a rule, of strips of metal wound in such a way that a great number of small passages are formed. As an example



of a very reliable design, fairly cheap to construct and easily cleaned, but necessarily with larger dimensions than the all-metal types, the so-called "gravel-boxes" should be mentioned.

In order to obtain efficient protection, if is not sufficient that a suitable design of flame arrestor be used; also the way in which it is installed should meet certain demands which will be readily understood when the principles of its operation are considered. From the fact that the working of the flame arrestors as described is based on the extraction of heat from the gases, it is evident that the amount of burning gas flowing through the flame arrestor and its velocity of flow play an important part.

In the case of a flame arrestor of proper design placed at the end of a pipe open to the atmosphere, and through which an explosive mixture is flowing, an explosion occurring in the atmosphere will be withheld from entering into the pipe without difficulty. The explosion taking place in the open atmosphere cannot create an overpressure which drives large quantities of burning gas through the flame arrestor.

When, however, somewhere in the pipe-line, and not in the immediate vicinity of the flame arrestor, an explosion starts, the explosion wave starts with the low velocity of the explosion propagation, but as a result of the building up of the pressure in the closed line, the velocity greatly increases, so that a large volume of burning gases is driven with great velocity through the flame arrestor.

Use of Explosion Discs

However, it is possible to arrive at a practical solution for obtaining efficient protection, when the layout is made in such a way that the explosion wave, with the large amount of burning gas arriving with great velocity at the flame arrestor, is given a direct outlet. The direct outlet to the explosion wave can be given by means of an explosion disc. It is, however, essential that the explosion disc should be placed perpendicular to the direction of the oncoming wave. A different position of the breaking disc will not sufficiently relieve the flame arrestor, and the explosion will go through.

The accompanying sketch illustrates experiments carried out with a gravel box made of a piece of 12 in. pipe, length about 1 metre, provided with two 4 in. nozzles at 0.75 metre centre distance and filled with gravel. The pot was fitted between two lengths of 6 in. pipe, shut off at the free ends. The pipes and gravel box were filled with an explosive gas air mixture, which was ignited on one side of the pot by an electric spark. The progress of the explosion was made visible by sprinkling some barytes powder on the pipes. Without breaking flanges, the explosion passed right through the gravel box to the pipe on the other side. With a breaking flange as arranged in the sketch the explosion coming from the left-hand side was free to escape in front of the gravel pot, and did not pass through it. This arrangement will only arrest an explosion coming from the left side.

Plastic Materials for Aircraft Construction

Favourable Comparison with Wood and Metals

IN the laboratory laminated plastics have been manufactured with tensile strengths up to 40,000 lb. per square inch, but these are not yet available commercially, it was stated in the course of a joint lecture by Messrs. George Dring, M.A., B.Sc., F.I.C., and C. D. Philippe of Bakelite, Ltd., before the Royal Aeronautical Society, Portsmouth, recently. On a strength/weight ratio basis these materials compare favourably with wood and metals employed in aircraft construction as is shown in the following table which gives actual strengths of standard materials divided by their specific gravity:—

	In Tension.	*In Compression.*
Stainless steel	23,600 lbs. per sq. in.	19,100 lbs. per sq. in.
Magnesium alloy	25,400 ,, ,, ,,	19,300 ,, ,, ,,
Aircraft spruce	23,300 ,, ,, ,,	11,600 ,, ,, ,,
Bakelite cord filler	22,200 ,, ,, ,,	20,100 ,, ,, ,,

The strength/weight ratio does not, it was pointed out, give the designer all the information he requires. The modulus of elasticity is thus of considerable importance and, at the moment, plastics do not compare favourably with other materials in this respect. Bakelite laminated material at present available has a modulus of elasticity figure roughly the same as for aircraft spruce but distinctly inferior to magnesium alloy and stainless steel. Under laboratory conditions, however, plastics have been produced with an elasticity comparable with magnesium alloy and it is merely a question of time before the laboratory material becomes a commercial product.

THE L.C.C. JUBILEE

The jubilee of the London County Council, which was celebrated last Thursday, drew attention to the tremendous strides made in the Metropolis since the days when a band of public-spirited citizens set out to build a better city fifty years ago. A survivor of the first Council, Lord Dickinson, pays a striking tribute to another original member, the late Sir John Benn, founder of Benn Brothers, Ltd., publishers of THE CHEMICAL AGE. Writing in *The Times*, he recalls that one of the first tasks of the Council of 1889 was to set up a Highways Committee, which "soon found work for itself owing to the presence of the most untiring personality on the Council, John Williams Benn. Benn sat on the Council for 35 years giving unremitting service to the London which he loved. There were few departments of the Council in which he did not play a leading part; but his great interest lay in the purchase and working of the tramways, their electrification, and other developments of traffic. Lord Dickinson adds that, although new inventions are now displacing much of what Sir John built up, "the example that he set of honest, unselfish labour on behalf of the public will long persist as an inspiration to future generations of London workers."

Letters to the Editor

The Five-Day Week

SIR,—May I heartily congratulate you on the celebration of the anniversary of the introduction of the five-day working week.

Twenty-one years is a long time in industrial life, and it is truly amazing to recall the early stages of what might well be called a crusade. There is still a lot of ground to be covered, however, and I should like, as a director of a company which has instituted a five-day week in all its factories, to draw the attention of firms which are still hesitating, to some of the many advantages of the five-day week.

In the first place, the elimination of half a day does not increase production expenses by anything like the amount which might at first sight be imagined. In common with other firms which have introduced the five-day week, we have found that employees work better during the rest of the week, that we benefit considerably from the extra time made available for special repairs and general maintenance work of machinery, etc., and that there is an improvement in the health of the employees that constitutes an inestimable gain.—Yours faithfully,

ALBERT VAN DEN BERGH,
Vice-Chairman.

Lever Bros. and Unilever, Limited.
Unilever House,
Blackfriars, London, E.C.4. March 17.

SIR,—Your firm was ahead of its time in introducing the five-day week, and you are to be congratulated on your pioneer work.

As chairman of a company which has instituted a five-day week, I have taken a particular interest in the subject. With increased rates of production due to improved business organisation and mechanical ingenuity in devising machines for doing at far greater rates what was formerly done by hand, the productive capacity per man per hour has increased in greater proportion than the consumptive capacity per head of the population. The natural result of this is that not so many hours of work are necessary, even for a greater production, and all work-people are, therefore, able to have more leisure.

By concentrating the work into five days instead of spreading it over five and a half, not only does the workman get two whole days rest over the week-end, but Saturday morning is made available for cleaning, maintenance and repairs of machinery and factories.

There is one aspect of the five-day week which has not yet been adequately considered—the need to provide recreation for the work-people on Saturday mornings as well as Saturday afternoons.—Yours faithfully,

G. CUNNINGHAM,
Chairman and Managing Director.

The "Triplex" Safety Glass Co., Ltd.,
1 Albemarle Street,
Piccadilly, London, W.1. March 17.

The Henry Edward Armstrong Memorial Fund

From *Sir Arnold Wilson, M.P.*

SIR,—We feel sure there are many among your readers who would like to know that it is proposed to establish a Trust Fund to the memory of the late Professor Henry E. Armstrong, F.R.S. This letter should not be construed as a generally directed appeal, but one to those who knew and loved Armstrong and would be glad to be associated with the proposed memorial. The idea originated with his old colleagues and past students. A committee has been formed which includes representatives of the numerous interests and institutions with which he was associated and it is felt that the wide circulation of your columns will bring this appeal before the many who may desire thus to testify to their appreciation of his work.

At the Finsbury Technical College, and later at the Central College, South Kensington, Professor Armstrong and his co-workers, Ayrton and Perry, tried out and established the principles of technical education in this country, and thus encouraged the foundation of polytechnics and technical colleges throughout the realm. Not only was Armstrong a crusader in education and a pioneer in technical training over a period of sixty years; he was, by reason of his wide knowledge and experience and his understanding of humanity, one of the broad, clear, practical thinkers of the 19th and 20th centuries. His influence was great, constructive and lasting. A fearless critic of some and a champion of others, he nevertheless drew about him a wide circle of friends, some of whom he chastised with whips, some of whom he led by the hand in the most kindly manner. One found him a man of singleness of purpose, interested in so much that really matters; in education, chemistry, biology, agriculture, geology, music, art and literature, and, above all with a fine appreciation and a human understanding of his fellow men. Small wonder, therefore, that among those who came under Professor Armstrong's influence, whether they shared or differed from his views, there is a strong desire to honour in some suitable way a great personality whom they loved, admired and respected.

Friends, old colleagues and past students have decided to establish a Trust Fund to perpetuate the memory of his dynamic personality. The aim, financially, is a modest one, so that all, including those who met him in other walks of life, may feel that they are contributing an integral part to the memorial whatever the dimensions of their individual contribution. Subscriptions should be sent to the Hon. Treasurer, Sir Alfred Chatterton, C.I.E.

The hope is for a memorial fund totalling about £3,000. This will provide a guarantee fund to give, as it accumulates, sufficient to ensure the publication (or to give substantial financial assistance in the publication or preparation) of any original works, within the ambit of Professor Armstrong's recognised interests, that would not otherwise see the light of day. It will also be within the term of the Trust to arrange for suitable public lectures by the authors of the works. An additional detail of the plan is that the publication itself will carry as frontispiece a portrait of Professor Armstrong, a biographical note and a reference to the foundation and objects of the Trust. Furthermore, the fund will provide for a memorial plaque, or bust, for the City and Guilds College, South Kensington, and perhaps replicas elsewhere.

The administration of the fund, it is proposed, shall be undertaken by six persons, one each from the Council of the Royal Institution of Great Britain; the Royal Society; the City and Guilds of London's Institute; the Royal Society of Arts; one additional member whom the above representatives may appoint and the author of the most recent work published under the Trust.—Yours faithfully,

ARNOLD WILSON,
Chairman of the Committee.

[The other officers of the Committee are: *Hon. Treasurer,* Sir Alfred Chatterton, The Coppice, Beckenham, Kent; *Hon. Secretaries,* C. E. Browne, Esq., and Dr. J. Vargas Eyre, Great Burgh, Epsom.]

B.S. SPECIFICATION FOR WINCHESTER BOTTLES

The British Standards Institution announced this week the publication of a new Standard for "Winchester Bottles" (B.S. 830-1939). This specification refers to the most usual sizes of Winchester bottle, namely, 80 and 90 fluid ounces nominal capacity respectively. Four alternative methods of closure are provided, but details are given only in the case of ground glass stoppers and external screw caps. The same diameter has been adopted for both sizes in order to facilitate packing, and a minimum weight of glass has been laid down. Provision is made for plain or fluted bottles.

"Problems of Compressors and Compressed Gases in Industry"

Discussion of Mr. R. L. Quertier's Paper

AN interesting discussion followed Mr. R. L. Quertier's reading of his paper "Problems of Compressors and Compressed Gases in Industry" at the meeting of the Institution of Chemical Engineers at Burlington House, London, on Tuesday of last week. Extracts from the paper itself were published in our last week's issue.

PROFESSOR D. M. NEWITT thanked the author for what he described as a very able account of the practical working of air compressors in industry. The paper was confined, he said, to the use of comparatively low pressures and to the ordinary use of compressed air for mechanical and other similar purposes; the title included "compressed gases in industry," but nowadays air was not one of the important gases used. So far as it went, the paper was very interesting, but to the chemical engineer it was by no means the whole story. In the course of his discussion of the compressor, he pointed out that there were numerous processes in which pressures of something like 200-300 atmospheres were used. The theory of the subject implied that one could not design a compressor for high pressure work which would be universally efficient for all gases, but each compressor must be designed for the particular gas it was desired to compress.

Design of Compressors for Gases other than Air

MR. A. H. TAYLOR, commenting on the facts mentioned by Professor Newitt concerning the design of compressors for gases, and the differences one was likely to come across in designing compressors for various gases after having designed for air, said that his experience suggested that quite a number of British manufacturers had not taken those points into consideration sufficiently. Besides the variation in the specific heats and compressibility factors, there was the fact that leakage was a much more important problem when dealing with some gases than with air. For example, at the Fuel Research Station, where they were dealing with hydrogen mostly, compressed to 6,000 or 7,000 lb., one small compressor which they had specified was to be used for hydrogen had been fitted with a drip feed lubricator on the inlet pipe; when it was connected up to the hydrogen gasholder, which was at 3 or 4 in. pressure, the hydrogen had simply bubbled through. That was an example in which the maker of the compressor had been thinking in terms of air and not of a gas which one would expect to obtain from a holder.

MR. H. BANNISTER, dealing with the point made in the paper that compressors, and more especially vacuum pumps, must necessarily have a very small clearance volume, otherwise they would not work at their highest efficiency, said that obviously, unless some volume were allowed, wear would cause the piston to touch the end of the cylinder. That would probably end in disaster. He asked if the author would indicate from his experience what allowance should be made in practice.

MR. L. L. BARNES said that his sympathies were very much with Mr. Quertier, for he had attempted to cover an extremely wide field in the time available. They had been reminded of the effects of hydrogen and other gases, apart from air, on the design of compressors; but there were also many practical problems, particularly, for instance, concerning glands, in the higher pressure compressors such as those compressing to 3,500 lb. per sq. in. In connection with synthetic ammonia, he had had experience of enormous four-stage compressors absorbing about 2,500 h.p.; and although, where possible, the second and third stages, for instance, were retained at the bottom of the double-acting cylinders, there were times when it was necessary to have the full 250 or 260 atmospheres on the bottom of the cylinder. Therefore a gland which was capable of remaining tight to that pressure had to be designed. The packing must obviously be of metal, and to give reasonable service as a bearing it must be adequately lubricated; and that was not an easy matter, as a gland had to be held by springs and segments tight on the piston, and outwards tight on the stuffing box.

Perhaps the sources of greatest trouble to users of compressors were the valves. There were various types of valves, but his experience had indicated that there was much to be said for the loose plate valve with a spring separate above it, adequately designed, rather than a combination of the two in the spring plate. It seemed that the latter was liable to break more frequently than the separate spring and plate. Some reputable makers of compressors had made valves in which there was a loose plate and tiny springs, about $\frac{1}{4}$ in. diameter and $\frac{1}{2}$ in. long, almost hair springs. He had taken out the small springs from each valve and had put in a big spring of almost the diameter of the plate—4 in. or 6 in. in diameter, and perhaps 2 in., or certainly 1 in., long. Such springs, if rightly designed, would go on for ever.

On large compressors he recommended the use of thermometers, particularly distant-reading thermometers, to indicate the temperature of the gas at the various stages, because in his experience one obtained by that means a better indication of the state of the valves than could be obtained from pressures alone.

He was a little disappointed that the author had made no reference to rotary compressors of the blower type, because up to a point they were very useful machines. He had had them working up to something like 150 atmospheres, multi-stage, including a big one of about 2,000 h.p. There was the obvious advantage that friction was less, for there was only the friction of the shaft and not of cylinders. In a reciprocating compressor there was leakage past the piston on account of the difference in pressure between the two sides of the piston, but in a rotary compressor the difference of pressure was between stages, and that difference was small. In works where two or three different pressures of air were required, the most common system, he believed, was to have one compressed air service, from which air was taken for nearly all uses, there being loss of power through reducing from high to low pressure. He suggested that if the rotary blower type of air compressor were used, and if two pressures were required, it might be possible to take out a pressure from the rotary blower, say, half or three-quarters of the way along, rather equivalent to a pass-out turbine. That would not be possible with a reciprocating compressor, but it might be possible with a rotary blower.

Determining Conditions for Mixed Gases

MR. R. H. KEACH said that it was comparatively simple to determine conditions after compression when a pure gas or compound was compressed, but what happened when a mixture of compounds was being compressed, as, for example, methane and ethane? He wondered whether, under those conditions, it was permissible to use a partial pressure of each of the two gases, working out the conditions after compression for each of the gases and combining afterwards, because from the literature the compressibility factors of each of those two gases could be ascertained and the conditions could be worked out from those factors.

MR. R. L. QUERTIER replied to the discussion. Dealing first with the criticism concerning the omissions from the paper, he said that when the title was chosen, about fifteen months previously, he had been asked to deal with the subject comprehensively. He personally was concerned mostly in practice with what was more or less the low pressure branch of the subject, and he felt that the best way in which to deal with the side of the subject discussed by Professor Newitt was to provide another paper on it. Such a paper would definitely come better from Professor Newitt than from himself.

A point arising out of the remarks of Mr. Taylor was that it was impossible for any manufacturer to gain the experience and knowledge of the user of special gases at high pressures normally. There might be special cases in which manufacturers could gain some of that experience and knowledge, but mostly they were dependent on the valuable information they obtained from the users. It would be appreciated, however, that those who were dealing always with high pressure work had a different outlook from that of the ordinary engineer. Therefore, while agreeing that in writing the paper he had perhaps strayed rather far from the title, he had tried to deal with problems which the ordinary engineer would meet within the range of the machine dealt with in the paper.

Replying to Mr. Bannister, he said that clearance volume was important, but it was much more important to make certain that the machines continued to run, and clearance must be allowed for wear of bearings, increasing temperature, length of rod, and so on. In a small machine the allowance might be 1/16th. in. or even 1/32nd. in., and in a double-acting machine it might be ¼ in. In a single-acting machine it would be less than in a double-acting machine, but it was a question of how much the clearance could be increased without the possibility of the piston hitting the cylinder. He was not sure that there would be a disaster if that happened, but it would be obvious what was happening by reason of the noise and knock. In a vacuum pump, clearance was much more important; but in a compressor the efficiency was not very much affected by clearance, within reasonable limits. He had seen glands such as were mentioned by Mr. Barnes, and he supposed that in that case the users had been able to give some hints and advice to the manufacturers. The machines were very good. Valves were the most hard-worked parts of compressors, and it was not to be wondered at that breakage occurred. Discussing two valves of the ring type made by his own firm, he said that the first had concentric rings, each sealed by a valve plate, and it was necessary to use very small springs. In the second all the rings were jointed together by means of bars between the outer circumference of one ring and the inner circumference of the next larger ring. By placing a spring on the bars a good size spring could be inserted, and that was a very useful modification. Even those valves sometimes broke, and indeed, he had yet to find a type of valve which would not break. The idea of using thermometers was a very good one, because if a valve broke, the air was compressed twice and the temperature increased.

With regard to turbo compressors, and drawing varying quantities of air away at an intermediate point, he said that if that were done the pressure rise in the remainder of the machine would be affected, because the throat ways through which the air passed remained of the same width. He would not, however, like to say that such an arrangement was not possible. He imagined that it would be easier with the reciprocating machine, because there was only a disturbance of the ratio. If the quantities taken away at low pressure were reasonable and the machine was designed to take care of them, he did not think there would be any real difficulty. He referred to Professor Newitt the question raised by Mr. Keach concerning the conditions when compressing mixed gases.

PROFESSOR NEWITT said that it was fairly simple to determine the conditions of mixed gases after compression. It was necessary to introduce into the expression for work one of the more accurate equations for state, and in those equations one could arrive at the constants for the gas mixture from the constants of the pure gases by taking the arithmetic mean. That had been tested out, and by combining the constants in that way it was possible to arrive at a very accurate representation of the condition of the mixture.

In conclusion, the president (MR. F. HERON ROGERS) proposed a hearty vote of thanks to Mr. Quartier for his able and lucid paper, and to Professor Newitt for having, in effect, added a section to it.

Decreased Consumption of Nickel

Annual Report of the International Nickel Co., of Canada

THE report of the International Nickel Co. of Canada, Ltd., for the year ended December 31 shows that the company realised a net profit of $32,399,470.23 after all charges. The comparable figure for 1937 was $50,299,623.81, and this is the first time since 1932 that profit failed to show an increase over the preceding year.

The company's sales of nickel in all forms were less than in 1937 and totalled 164,378,245 pounds, compared with 207,700,943 pounds in 1937. Sales, however, were still 31 per cent. in excess of the volume reported for 1929. World consumption of nickel suffered a recession in 1938 from its peak volume reached in 1937 and was estimated at 204,000,000 pounds, the total for the preceding year being 240,000,000 pounds. The decrease of nickel consumption occurred principally in the United States markets, the consumption in European and other markets as a whole showing little change.

As regards manufacturing activities in Great Britain, the nickel refinery at Clydach, Wales, produced 43,962,458 pounds of pellet nickel, comparable with 39,554,965 pounds in 1937, and, in addition, 2,447,239 pounds of nickel were absorbed in the production of 11,821,980 pounds of nickel salts, comparable with 2,430,130 and 11,755,800 pounds respectively in 1937. An Orford process plant for treating platinum metals materials was erected during the year. A special department, designed and equipped to take care of the chemical operations formerly carried on at the Smethwick works, Birmingham, was practically completed and the transference of that activity would take place early in the year, when the antiquated Smethwick works would be abandoned.

The platinum metals refinery at Acton increased its output of platinum metals and gold.

At the Wiggin works, Birmingham, and the Zenith works, Glasgow, of Henry Wiggin & Co., Ltd., there was a decrease in the combined output, the figures being 10,484,300 pounds in 1938 and 11,653,206 pounds in 1937.

Operating costs at the Wiggin works had shown a slight trend upward, due to increased wage rates, higher supplies costs and reduced throughputs, but the effect of these factors was considerably offset by increased efficiency in plant operations. At the Zenith works the output of Monel products increased by 21 per cent. over 1937.

The report went on to state that the steel industry consumed the major portion of world nickel production, but, particularly in the United States, it suffered substantial recession of activity and nickel deliveries to steel plants, mills and foundries were diminished in 1938 as compared with 1937. The continued trend in this industry was, however, in the direction of greater use of nickel by steel manufacturers. Stainless steel products were at present making substantial and impressive contributions to the total of nickel consumed in the steel industry. Deliveries of nickel to foundries were well maintained and in many cases did not fall below those of the preceding year.

Shipments of the companies copper represented about 6½ per cent. of the total world deliveries estimated at 2,200,000 tons, while their sale of platinum metals amounted to 193,195 ounces, which was approximately 2 per cent. above the figure for 1937. Their Canadian production of gold amounted to 69,476 and the output of the Acton plant amounted to 13,610 ounces. Their sales of silver amounted to 2,470,500 ounces, compared with 2,356,170 ounces in 1937. The market demand for selenium was weaker during the year.

British Overseas Chemical Trade in February

ACCORDING to the Board of Trade returns for the month ended February 28, 1939, imports of chemicals, drugs, dyes and colours were valued at £1,126,177, an increase of £204,022 as compared with February, 1938. Exports were valued at £1,688,312, as compared with £1,669,539, an increase of £18,773. Re-exports were valued at £35,538.

Imports

	Quantities. February, 28, 1938.	1939.	Value. February, 28, 1938. £	1939.
Acids				
Acetic .. .. cwt.	8,898	8,469	10,573	10,372
Boric (boracic) .. ,,	2,200	6,130	2,470	6,874
Citric .. .. ,,	1,289	1,540	5,133	6,348
Tartaric .. ,,	2,030	1,466	9,452	6,855
All other sorts .. value	—	—	9,907	8,844
Borax .. .. cwt.	9,309	14,440	5,744	10,056
Calcium carbide .. ,,	77,110	127,828	41,868	59,167
Fertilisers, manufactured tons	3,573	4,035	14,920	12,497
Potassium compounds—				
Caustic and lyes cwt.	8,600	13,019	8,549	15,410
Chloride (muriate) ,,	36,390	54,868	11,703	17,183
Kainite and other potassium fertiliser salts cwt.	197,985	149,558	24,220	17,682
Nitrate (saltpetre) ,,	2,125	4,575	2,057	3,608
Sulphate .. ,,	20,026	19,220	9,308	8,816
All other compounds ,,	10,038	10,462	13,062	13,145
Sodium compounds—				
Chlorate .. cwt.	1,814	1,380	2,018	1,474
Chromate and bichromate .. .. cwt.	1,199	1,654	1,498	2,229
Cyanide .. ,,	1,000	41	2,269	126
Nitrate .. .. ,,	203,963	38,024	49,048	9,068
All other compounds ,,	14,510	15,909	13,985	12,124
Chemical manufactures value	—	—	255,350	392,389
Drugs, medicines and medicinal preparations—				
Manufactured or prepared—				
Quinine and quinine salts .. oz.	94,981	79,791	7,926	7,272
Medicinal oils .. cwt.	2,817	5,860	6,132	17,571
Proprietary medicines value	—	—	64,225	78,611
All other sorts .. ,,	—	—	51,059	37,306
Finished dye-stuffs obtained from coal tar cwt.	2,360	3,624	75,170	125,664
Extracts for dyeing ,,	3,317	2,093	7,100	3,812
Extracts for tanning—				
Chestnut .. ,,	21,856	31,504	15,186	21,442
Quebracho .. ,,	26,262	35,612	23,824	32,413
All other sorts .. ,,	58,450	21,137	48,959	17,480
All other dyes and dye-stuffs .. .. cwt.	1,360	1,034	10,203	25,147
Painters' and printers' colours and materials, not elsewhere specified—				
White lead (basic carbonate) .. cwt.	4,467	4,453	6,474	6,131
Ochres and earth colours cwt.	24,617	40,651	7,925	14,075
Bronze powders and other metallic pigments .. cwt.	1,275	1,644	10,197	13,005
Carbon blacks .. ,,	32,957	43,785	45,599	57,985
Other pigments and extenders, dry .. cwt.	65,018	31,517	13,146	6,802
Lithopone .. ,,	21,594	22,050	13,887	14,642
All other descriptions ,,	8,886	14,938	22,009	32,552
Total .. .. value	—	—	922,155	1,126,177

Exports

Acids—				
Citric .. .. cwt.	2,052	2,429	9,705	11,133
All other sorts .. value	—	—	23,982	23,122
Aluminium compounds tons	1,277	2,788	9,090	35,827
Ammonium compounds—				
Sulphate .. ,,	26,188	18,293	166,850	121,683
All other sorts .. ,,	935	4,199	12,625	50,851
Bleaching materials—				
Bleaching powder (chloride of lime) .. cwt.	45,013	52,888	11,929	13,705
All other sorts .. ,,	2,229	5,521	6,257	14,259
Coal tar products—				
Cresylic acid .. galls.	143,637	158,913	26,871	17,314
Tar oil, creosote oil ,,	2,173,779	1,861,830	60,900	44,556
All other sorts .. value	—	—	13,810	7,870
Copper, sulphate of tons	4,092	3,874	69,332	66,093
Disinfectants, insecticides, etc. .. .. cwt.	26,592	33,772	53,788	64,917
Fertilisers, manufactured tons	15,610	11,520	62,109	58,719
Glycerine .. .. cwt.	9,796	2,653	40,015	6,612
Lead compounds .. ,,	13,198	9,709	18,295	14,023
Magnesium compounds tons	395	412	10,877	10,177
Potassium compounds cwt.	5,152	7,918	10,115	11,818
Salt (sodium chloride) tons	10,476	13,786	33,051	41,962
Sodium compounds—				
Carbonate, including soda crystals, soda ash and bicarbonate cwt.	341,263	339,836	83,067	74,452
Caustic .. .. ,,	126,470	157,842	67,517	84,267
Silicate (water glass) ,,	23,989	16,483	6,572	4,719
Sulphate, including salt cake .. .. ,,	3,020	14,335	1,139	1,821
All other sorts .. ,,	37,108	48,665	57,137	72,771
Zinc oxide .. .. tons	1,093	1,263	22,551	22,669
All other descriptions value	—	—	174,699	176,691
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts .. oz.	131,582	123,381	14,756	14,297
Proprietary medicines value	—	—	112,447	96,366
All other descriptions ,,	—	—	123,101	125,539
Dyes and dye-stuffs and extracts for dyeing and tanning—				
Finished dye-stuffs obtained from coal tar—				
Alizarine, alizarine red and indigo (synthetic) cwt.	1,711	432	9,862	2,881
Other sorts .. ,,	4,973	5,573	63,280	94,364
Extracts for tanning ,,	15,556	17,315	13,578	14,574
All other descriptions ,,	1,292	1,682	6,742	7,771
Painters' and printers' colours and materials—				
Ochres and earth colours cwt.	8,480	9,197	9,089	10,734
Other descriptions ,,	6,441	7,233	23,776	22,614
White lead .. ,,	6,355	2,832	13,458	5,349
Ships' bottom compositions .. .. cwt.	3,211	2,295	12,427	7,475
Lithopone .. ,,	2,794	5,658	2,153	4,115
Paints and painters' enamels .. cwt.	32,838	38,126	97,837	105,408
Varnish and lacquer (clear) .. galls.	53,117	60,038	21,180	24,400
Printers' ink .. cwt.	3,611	4,750	18,677	23,303
All other descriptions ,,	39,373	36,902	74,893	77,091
Total .. .. value	—	—	1,669,539	1,688,312

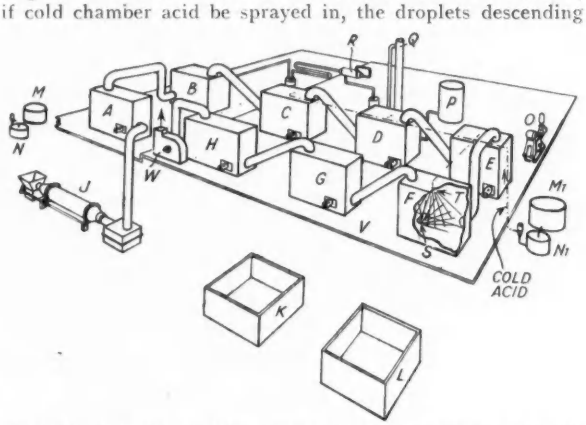
Re-Exports

Chemical manufactures and products .. value	—	—	32,655	17,323
Drugs, medicines and medicinal preparations–value	—	—	10,191	14,477
Dyes and dye-stuffs and extracts for dyeing and tanning cwt.	806	281	1,373	2,553
Painters' and printers' colours and materials cwt.	297	639	596	1,185
Total .. .. value	—	—	44,815	35,538

Chamber Process Sulphuric Acid Plant

A New Design by H. T. Watson, Ltd.

MANY different designs of chambers and towers of sulphuric acid plant have been introduced with the object of increasing the condensing surface presented to the reacting gases. The chief drawback against these towers was the excessive heat generated which accumulated and eventually cancelled out the beneficial effect of the large surface. The Mills Packard water-cooled chambers were successful in dealing with this problem. It was the water-cooled chamber which caused the belief to be abandoned that a chamber space 12-15 cu. ft./lb. of sulphur was necessary, and enabled acid to be produced with a 3 cu. ft./lb. of sulphur chamber space. It has since been shown that a further increase of nearly 20 per cent. in acid output from the same chamber space as previously used can be obtained by introducing a spray of cold acid into the chambers. This system of spraying has two advantages; the provision of a large condensing surface, and the removal of heat introduced by the burning of the sulphur and the chemical reaction in the chamber. Further, if cold chamber acid be sprayed in, the droplets descending



through the hot chamber gases become warmed, with the liberation (in the chamber itself and for immediate use) of nitrogen oxides. The effect of the large surface area and the immediate utilisation of catalyst gases increases the speed of formation of sulphuric acid, with a consequent possible reduction in chamber space for a given acid throughput.

The success of cold acid spraying on the commercial scale led to the development of spraying up the bottom chamber acid and again increasing the surface area with a further increase in efficiency. The old principle of spraying up acid by rapidly rotating rollers or fanners was thus introduced into the design. It had been calculated that the total surface area in a chamber 10 ft. by 10 ft. by 5 ft. with the rotor sprays in operation would be equal to the surface area in an average size water cooled chamber. From this it was seen that if so large a surface area could be obtained by spray, there should be no reason why this method should not be used in place of the Glover and Gay Lussac towers. This would mean a big reduction in the capital outlay by the elimination of high towers and packing and also certain reductions in pumping costs.

The plant illustrated in isometric projection is a four chamber plant designed to produce 50 tons of chamber acid per week. A rotary sulphur burner provides the sulphur dioxide and the hot gases would be passed up the duct into the lower half of the denitrator which consists of an acid resisting brickwork chamber cased in lead and braced with R.S. joists. Two silicon iron rotors placed opposite each other spray up the bottom acid continuously, the hot gases causing concentration of the acid. The cooled gases are then passed into the second denitrator B where a similar procedure occurs. From here the sulphur dioxide and nitrogen oxides intro-

(*Continued on foot of next column.*)

duced into the duct leading from the denitrator, pass into the first chamber where the first acid is made. The chambers are constructed of lead suspended on a steel framework and are fitted with a spray rotor, cold acid sprays and water sprays. Finally the gases are passed through two absorbers in series; these take the place of the Gay Lussac towers and are of identical construction to the chambers except that they are not fitted with spray nozzles but have two spray rotors.

Some acid from the chamber bottoms is run by gravity to the denitrator B for concentration; nitrous-vitriol is also run from the absorbers by gravity for de-nitration. The acid from denitrator B is sent to denitrator A where it is further concentrated and pumped *via* acid cooler to the absorber H were it is re-sprayed to absorb the nitrogen oxides. The chamber acid required for use is run into store tank K, the other tank L receiving the concentrated acid from denitrator A by pump N.

Acid from the chambers is circulated through the acid sprays *via* acid pump N_1 and cooler M_1. The water for the sulphuric acid make is sprayed in the usual manner by means of the pump O.

Synthetic Glycerine

Production Developed to the Commercial Stage in America

IN the *Chemiker Zeitung* of February 8, 1939, page 100, attention was directed to a recent lecture delivered to the American Petroleum Institute by E. C. Williams reviewing work done by the Shell Development Co. with a view to enlarging the field of petroleum employment. Among the developments discussed was the synthesis of glycerine from petroleum, which has been developed to the commercial stage. The economic aspect of synthetic production of glycerine was stated to be satisfactory, even at the present comparatively low price of glycerine.

Of the methods proposed for glycerine synthesis at different times, the best prospects in a technical sense is possessed by the hydrolysis of 1,2,3-trichloropropane, but the preparation of this latter compound by direct chlorination of propane or by the further chlorination of 1,2-dichloropropane is somewhat expensive. Trichloropropane can be manufactured by the action of chlorine on allyl chloride, and the latter appears to be the suitable raw material. But the use of allyl chloride has been hindered by the lack of a suitable manufacturing process. After considerable research it was found that by chlorinating propylene at temperatures between 400 and 600° the reaction proceeded almost quantitatively, giving allyl chloride in 85 to 90 per cent. of the theoretical yield. The residue consisted of vinyl chloride, some olefine not substituted, and quite small quantities of dichloropropane.

Chemical Matters in Parliament

Acid Calcium Phosphate in Flour

In the House of Commons last week Major Braithwaite asked the Minister of Health whether he was aware that certain millers were introducing calcium into the flour they manufacture for human consumption; whether medical evidence showed if this practice was conducive to the good health of the public; what percentages were used; and whether his Department was consulted before this practice commenced.

Mr. Elliot replied that he was aware that calcium in small quantities was introduced into flour in the form of acid calcium phosphate to improve its baking qualities and also as a self-raising ingredient. He had no evidence that its use was detrimental to health. The Departmental Committee on the treatment of flour with chemical substances reported in 1927 that the use of this substance had then been a regular practice for nearly 20 years, and that after consideration of all the available evidence they could not recommend its elimination.

(*Continued from preceding column.*)

RECENT TRADE LITERATURE

Examples of chemical plant manufactured by KESTNER EVAPORATOR AND ENGINEERING CO., LTD., are given in a recent catalogue of the company. Among the various types of installations illustrated are evaporators, spray driers, sulphur burners, distillation plant, systems of electric heating and fluid heat transmission, acid pumps, stirrers and mixers, etc.

FREDERICK BRABY AND CO., LTD., have issued a catalogue dealing with their A.R.P. equipment. Sections are devoted to shelters, air purification and air circulating plants, windows, doors, shutters and emergency exits and accessories and equipment. In the ventilating plant a special feature has been made of the arrangement for easy and quick replacement of the used filter cartridge. The removal of this cartridge automatically closes a patent valve on the intake pipe, which remains closed and prevents gas-laden air entering the shelter until a new cartridge has been inserted.

JOHNSON, MATTHEY AND CO., LTD., have recently issued an attractive booklet dealing with Matthey cadmium pigments, which have cadmium sulphide as a basis. The sulphide itself may, according to the method of manufacture, be obtained in any colour from pale yellow to orange. Redder shades are obtained by the incorporation of selenium with sulphide, so that it is possible to get a complete range from pale yellow through orange and red to deep maroon. It is claimed that the pigments are stable to all atmospheric conditions and are absolutely fast to light. The applications of cadmium sulphides, cadmium lithopones, oxides and other cadmium pigments in different industries are described.

Ample space for toggle-type switches, for connecting any one of a number of couples to the measuring circuit, is provided in a new temperature indicator made by the LEEDS AND NORTHRUP CO., Philadelphia, Pennsylvania, and described in a recently issued catalogue. Installed wherever convenient, it enables an operator to measure temperatures of near or distant couples with equal reliability, by simply turning a knob, until a pointer comes to zero, and reading a temperature scale. Use of a potentiometer measuring circuit, hand-standardised, but with automatic reference-junction compensation, eliminates uncertainties due to circuit-resistance variables. Scale is practically uniform and equally accurate throughout, and can be calibrated for single or double range, the latter for use with similar or different couples. Built-in terminals, check key and mercury thermometer can be included for checking with a portable indicator.

In designing the Maxoil expeller, ROSE, DOWNS AND THOMPSON, LTD., have attempted to remove as far as is practicable many objectionable features existing in other types and to provide a high pressure expeller on which the time and labour required for maintenance is reduced to the absolute minimum and which, though compact and occupying little space, has a high capacity. Leaflets issued by the company state that though enclosed, all parts of this expeller are very easily accessible by means of detachable lift-off covers which promote cleanliness and avoid waste of oil. A notable advance in expeller design is claimed to be the vertically parted and hinged pressing barrel or cage. When altering the barrel spacing to change from a high oil content seed to one of lower oil content, or vice versa, or when changing the pressure worms, it has hitherto been necessary to remove completely the heavy barrel from the machine, a somewhat laborious and lengthy operation. The barrel of the Maxoil expeller, however, need never be removed from the machine for any purpose whatever. When opened, each half of the barrel folds down on to the machine base giving complete access to the interior and to the pressure worms. Pressure worms can be changed without removing the worm shaft from the machine, but where it is desired to have a spare shaft with worms already assembled in readiness to replace a worn set of worms, the changing of shafts can be effected without disturbing the driving gearing in any way.

NEW TECHNICAL BOOKS

SECOND YEAR COLLEGE CHEMISTRY. 4th edition. Revised by William H. Chapin and Luke E. Steiner. Pp. 407. New York: John Wiley and Sons, Inc. London: Chapman and Hall, Ltd. 9s. 6d.

In making the changes for the 4th edition, the authors have been concerned with stating or restating and discussing some of the fundamental principles of chemistry so as to furnish the student with a scaffolding for his array of chemical facts and a foundation for his later chemistry courses. As it is designed for the second year student the treatment is elementary, but at the same time it is designed to be exact enough to furnish him with concepts which he can apply and amplify in his later courses without radical revision.

THEORETICAL QUALITATIVE ANALYSIS. By J. H. Reedy. Pp. 451. London: McGraw-Hill Publishing Co. 18s.

The facts and theories upon which qualitative and quantitative analysis are based are given in this book in a manner to serve especially the student who is beginning the study of analytical chemistry. The author has endeavoured to present his subject in the simplest manner, so that the student will not be confused by any fine distinctions or irrelevant statements. References to the chemical literature have been omitted also, for the sake of simplifying the text. The book is divided into two parts, theoretical and descriptive. Single chapters are devoted to general procedure in anion analysis, dry reactions of analytical chemistry, and systematic analysis. An explanation is offered for the author's treatment of the theory of ionisation. The partial ionisation theory of Arrhenius and the complete ionisation theory of Debye and other modern physicists are both outlined, but in applications and problems as given in the text the approach has been mainly that of incomplete ionisation. In other words, an attempt has been made to present the subject in an unbiased way. A background of descriptive and physical chemistry is given, because it is the author's view that in the absence of this background analysis becomes a mere mechanical procedure, usually memorised but seldom understood.

PROBLEMS IN ORGANIC CHEMISTRY. By Ernest Hamlin Huntress. Pp. 270. London: McGraw-Hill Publishing Co., Ltd. 12s. 6d.

This book presents a series of problems in organic chemistry and is the result of 15 years' experience in teaching the introductory course in organic chemistry at the Massachusetts Institute of Technology. It has sprung from the growing conviction that the efforts of the student can be greatly facilitated and his ultimate mastery of the subject markedly improved when his individual study of the material amply supplied by text-books and lectures is guided by much further suggestion of what he needs to know than can possibly be given during class time.

This book consists essentially of three main divisions, the first devoted to the monofunctional compounds of the aliphatic series, the second to corresponding compounds of the aromatic series, and the third to polyfunctional compounds (or compounds with more than a single type of function) drawn from either or both series. These three divisions are further subdivided into chapters, each of which deals mainly with some definite class of compounds. One feature of the book which deserves special mention is the inclusion in most chapters of Divisions I and II of a final problem organised as a topical outline. Further subdivision illustrates the manner in which the principle of co-ordinative cumulation of classes of compounds has been emphasised as a means of development of power in the subject. The first three divisions are mainly for undergraduates, but a fourth division has been prepared for the use of graduate students. In this, particular emphasis is laid upon the co-ordination of the principles of inorganic and physical chemistry with the strictly organic material.

Personal Notes

MR. A. P. CATHERALL, the well-known petroleum technologist, is on his way to Trinidad to make an independent report on Trinidad Consolidated Oilfields.

* * * *

MR. H. F. H. JONES has been appointed a director of the South Metropolitan Gas Co. He takes the place rendered vacant by the death of Mr. Harold Gundry.

* * * *

MR. H. F. SMITH and MR. J. R. HENRY, sons of the joint managing directors of the Colthrop Board and Paper Mills, Ltd., have been appointed directors of that company.

* * * *

DR. J. W. BEYEN is joining the boards of Lever Brothers and Unilever, Ltd., and Lever Brothers and Unilever N.V., on the termination of his present period of office as president of the Bank for International Settlements.

* * * *

LORD TRENT, chairman and managing director of Boots Pure Drug Co., Ltd., was elected chairman of the Council of University College, Nottingham, at the Council's meeting this week. Lord Trent has been a vice-president of the College and a member of the Council for 15 years.

* * * *

PROFESSOR JOEL HENRY HILDEBRAND, of California University, has been awarded the William H. Nichols Gold Medal of the New York section of the American Chemical Society in recognition of outstanding achievement in physical chemistry. More than 400 scientists attended a dinner at which Professor Hildebrand, who was cited for "his study of the solubility of non-electrolytes," was presented with the Medal.

* * * *

PROFESSOR I. MASSON, Vice-Chancellor of Sheffield University and formerly Professor of Chemistry at Durham University, was elected a Fellow of the Royal Society at the annual election of Fellows on March 16. MR. C. E. K. MEES, vice-president of the Eastman Kodak Co., Rochester, N.Y., and DR. E. E. TURNER, head of the Department of Organic Chemistry, Bedford College, London, were similarly honoured.

* * * *

MR. ROBERT W. PAUL, M.I.E.E., was awarded the sixteenth Duddell Medal on Friday by the Council of the Physical Society. The medal is awarded to "persons who have contributed to the advancement of knowledge by the invention or design of scientific instruments, or by the discovery of materials used in their construction." Mr. Paul is a pioneer in two distinct industries: the manufacture of electrical measuring instruments and the early development of the cinematograph.

* * * *

PROFESSOR R. B. FORSTER, A.R.C.Sc.I., Ph.D., D.Sc., F.I.C., has relinquished his post as Mody Professor and Head of the Department of Chemical Technology at Bombay University. Professor Forster graduated at the Royal College of Science, Dublin, in 1900, and from 1908 to 1911 he carried out research at Berlin University in chemistry and chemical technology, obtaining his Ph.D. in 1911. In 1916, after further research, he was awarded the D.Sc. by the National University of Ireland and three years later was made a Fellow of the Institute of Chemistry. Professor Forster was for five years research and factory chemist and later liaison officer to the production and control department of Levinstein, Ltd., which is now part of Imperial Chemical Industries, Ltd. (Dyestuffs Group). From 1921 until 1933 Professor Forster was senior lecturer in the Department of Colour Chemistry and Dyeing at Leeds University, a position which he resigned on his appointment at Bombay University as first Professor of Chemical Technology and Head of the Department.

OBITUARY

PROFESSOR ALBERT T. KING, B.Sc., F.I.C., Professor of Textile Industries in the University of Leeds, died on Tuesday, aged 54. He was honorary demonstrator in chemistry at University College in 1906 and in the following year he was appointed demonstrator and junior lecturer in chemistry in the University of Leeds, a position he held until 1911. For ten succeeding years he held appointments on the academic staff of the Imperial College of Science and Technology, London University, and during this period he also engaged in consulting work of an industrial and commercial character. In 1921 Professor King became chief chemist to the Wool Industries Research Association, Torridon, Headingley, Leeds, and as first holder of the office undertook the organisation and development of the chemical side of the Association's work. In June, 1933, he succeeded Professor A. F. Barker in the Chair of Textile Industries in the University of Leeds.

TO-DAY'S ANNIVERSARY

FRIEDLIEB FERDINAND RUNGE, who died on March 25, 1867, was professor of chemistry at Breslau and discovered quinoline in coal tar (1834). It was not until 1842 that Gerhardt obtained quinoline by distilling the alkaloid cinchonine with alkali. Pyrrol was also discovered by Runge (1834), but was not isolated. Quinoline was first synthesised from aniline by Skraup in 1880.

Foreign Chemical Notes

Sweden

A COPPER ORE DEPOSIT, in which iron pyrites is also present, has been discovered in the Fjäll district.

Dutch Indies

AGAR-AGAR IS NOW BEING PRODUCED on an experimental scale at the new factory of the recently established Nederlandsche Agar-Agar Fabriek at Koedoes.

Finland

PROMISING RESULTS HAVE BEEN OBTAINED in trials of the dust-laying power of waste sulphite liquors, the active component of which is the calcium salt of lignin sulphonic acid. The Enso-Gutzeit O.Y. has improved the efficiency of the material by concentration to a solid content of 50 per cent. A powder has also been prepared from the waste liquors.

France

ALUMINIUM METAL EXPORTS UNDERWENT a remarkable expansion in 1938, the official figure being 14,017 tons as compared with 6,972 tons in 1937.

A NEW PHENOL-DISTILLATION PLANT is now in full operation at the by-product works of the Cie des Mines de Bruay in the department of Pas de Calais.

Germany

A LARGE-SCALE HYDROGENATION PLANT is to be constructed near Stettin and will be operated by the Hydrierwerke Pölitz A.G.

EXTENSIONS TO THE PLANT OF THE BUNA-WERKE G.M.B.H. at Schkopau have now advanced to a stage when large-scale production of synthetic rubber can commence.

THE EQUIPMENT OF THE SEMPERIT OESTERREICHISCHE GUMMIWERKE A.G. of Vienna is to undergo modification with a view to working with Buna synthetic rubber in place of natural rubber. State-guaranteed credits have been granted for making the necessary alterations in plant at the company's factories at Traiskirchen and Wimpassing.

References to Current Literature

Inorganic

Lime-soda water softening. Arbatsky, *Chem. Fabrik, 12,* 89-96.

Production of hydrogen by the steam-iron method. Hurst, *Oil and Soap, 16,* 29-35.

Constitution of iodic acid. Nayar and others, *Z. anorg. Chem., 240,* 217-231.

Reactions with activated solid bodies. Hedvall, *Z. Elektrochem., 45,* 83-93.

Organic

Fermentation processes. Wells and Ward, *Ind. Eng. Chem., 31,* 172-177.

Ammoniated peat. Davis and Scholl, *Ind. Eng. Chem., 31,* 185-189.

Concentration of vitamins by molecular distillation. Jewell, Mead and Phipps, *J. Soc. Chem. Ind., 58,* 56-64.

Mercury catalysts in the manufacture of vinyl esters. Perrotet, *Rev. Générale Matières Plastiques, 15,* 5-9.

Substitution of aromatic hydrocarbons. Asinger, *J. prakt. Chem., 152,* 1-8.

Dehydrogenation. Sengupta, *J. prakt. Chem., 152,* 9-19.

Catalytic hydrogenation of organic compounds using carbon monoxide. Neunhoeffer and Pelz, *Ber., 72,* 433-439.

Acetylation of carbohydrates by ketene. Hurd, Cantor and Roe, *J. Amer. Chem. Soc., 61,* 426-428.

Analysis

Tin determination in ores. Hirsch, *Z. analyt. Chem., 115,* 184-185.

Determination of small amounts of oxygen in argon. Hoffmann, *Mikrochem., 25,* 82-84.

Standard solutions in quantative organic microanalysis. Niederl, Niederl and Eitingon, *Mikrochem., 25,* 143-150.

Electroanalysis with small amounts of materials. Hernler and Pfeningberger, *Mikrochem., 25,* 208-216.

Isolation and determination of traces of metals. Wichmann, *Ind. Eng. Chem. analyt. ed., 11,* 66-72.

Determination of potassium. Kolthoff and Bendix, *Ind. Eng. Chem. analyt. ed., 11,* 94-98.

Microtechnique of organic qualitative analysis. Schneide and Foulke, *Ind. Eng. Chem. analyt. ed., 11,* 111-114.

Determination of thiourea and thiocyanates. Williams, *J. Soc. Chem. Ind., 58,* 77-79.

Determination of hydrogen in technical gas analysis. Banerjea, Bhatt and Forster, *Analyst, 64,* 77-86.

Mineral Oils, Gas, Tar

Hydrogenation of shale oil. Pier, *Osterreichische Chem. Ztg., 42,* 33-39.

Cracking of gaseous hydrocarbons by spark discharge Amemiya, *J. Soc. Chem. Ind. Japan, 41,* 371-375 B.

Glacial acetic acid in petroleum refining. Bhatnagar and Ward, *Ind. Eng. Chem., 31,* 195-199.

Effect of pressure on lubricating greases. Farrington and Humphreys, *Ind. Eng. Chem., 31,* 230-235.

Gassing carbonaceous materials by air, carbon dioxide and steam, and the influence of inorganic catalysts. Kröger, *Angew. Chem., 52,* 129-139.

Cellulose, Paper

Chloroform and acetone-solubility of partially acetylated cellulose fibres. Sakurada and Morita, *J. Soc. Chem. Ind. Japan, 41,* 381-382 B.

Chemical losses from soda recovery furnaces. Gardner and Whitney, *Ind. Eng. Chem., 31,* 181-184.

Addition of sodium salts in pulping pine with neutral sodium sulphite liquor. Chidester and McGovern, *Paper Trade J., 108,* No. 6, 31-32.

Pine wood for cellulose and paper. Klem, *Papier Fabrik. (Techn. Teil), 37,* 49-54.

Dehydration of paper pulp. Schönemann, *Zell. u. Papier, 19,* 16-23.

Bleaching, Dyeing, Finishing

Coloured hydrocarbons. Wahl, *Rev. Générale Mat. Colorantes, 43,* 45-48.

Starch in textiles. Stallings, *Amer. Dyestuff Reporter, 28,* P 35-37.

Dyeing of naphthols by the continuous hot flue method. Williams, *Amer. Dyestuff Reporter, 28,* P 42-44.

New synthetic textiles in relation to wool. Thomas, *J. Soc. Dyers Colourists, 55,* 57-68.

Delustring of artificial cellulose and cellulose derivative fabrics by aftertreatment. Machu, *Melliand Textilber., 20,* 144-148.

Glass, Ceramics

Attack of glass by alkaline solutions and effect of dissolved ions. Geffchen, *Kolloid Z., 86,* 11-15.

Bentonite-containing whiteware. Lehmann, *Ber. Deutschen Keram. Ges., 20,* 2-11.

Dust investigations in the ceramic industry. Bloor, Goodall and Webb, *Trans. Brit. Ceramic Soc., 38,* 1-74.

Fireclay bricks in iron and steel works. Chester and Howie, *Trans. Brit. Ceramic Soc., 38,* 131-151.

Lithium carbonate in raw alkaline glazes. Richardson, *J. Amer. Ceramic Soc., 22,* 50-53.

Metals, Electrometallurgy

Electrodeposited coatings of tin on lead. Baier and Hoar, *J. Soc. Chem. Ind., 58,* 69-74.

Passivity and corrosion of metals. Müller, *Kolloid Z., 86,* 150-166.

Bright nickel plating. Stocker, *Amer. Electroplater's Soc. Monthly Rev.,* 1939, 111-121.

Silicon carbide additions to cast iron. Boyer, *Metals and Alloys, 10,* 8-13, 59-63.

Fats, Oils, Waxes

Modern oil milling. Downs, *Oil Col. Trades J., 95,* 715-721

Composition and drying rates of soybean oils. Kraybill, Kleinsmith and Thornton, *Ind. Eng. Chem., 31,* 218-222.

Bleached lac. Murty, *Ind. Eng. Chem., 31,* 235-239.

Heat bleaching of fatty oils. Boone, *Soap, 15,* No. 2, 23-25, 32.

Higher fatty alcohols. Mullin, *Soap, 15,* No. 2, 29-32.

Refined and unrefined tallow. Hartung, *Fette u. Seifen, 46,* 9-11.

Paints, Pigments

Glycol ethers as lacquer solvents. *Paint Techn., 4,* 21-23.

Elastic properties of paint films. König, *Farben Ztg., 44,* 83-84, 107-108, 133-135.

Testing of nitrocellulose lacquer films. Wolff, *Paint Varnish Prod. Manager, 19,* 40-44, 70.

Shellac in protective coatings. *Paint Varnish Prod. Manager, 19,* 46-49, 70.

Rubber, Resins, Plastics

Phenol-free oil-soluble artificial resins. Fonrobert, *Chem. Ztg., 63,* 137-139.

Petroleum solvents in rubber cements. Stewart and Rubek, *Rubber Age, 44,* 267-270.

Shellac in rubber. Mulford, *Rubber Age, 44,* 272-274.

Latex-like emulsions of non-vulcanisable polymerisation products. Craemer, *Kautschuk, 15,* 23-27.

Structure of artificial plastics molecules. Staudinger, *Kunststoffe, 29,* 1-3.

Foamed latex sponge. Elden, *India Rubber World, 99,* 31-34.

Miscellaneous

Molecular distillation. Fawcett and Burrows, *J. Soc. Chem. Ind., 58,* 43-56.

General News——From Week to Week

THERE WAS AN INCREASE OF £9,866, or 172 tons, in the sales of the chemical sundries factory of the Scottish Co-operative Wholesale Society, Glasgow, for the quarter ending February 11, 1939, compared with the corresponding period of last year.

THE SEVENTEENTH EXPOSITION OF CHEMICAL INDUSTRIES will be held this year at Grand Central Palace, New York City, during the week of December 4 to 9. At the last Exposition, in 1937, visitors came from over 1,358 cities and towns in 45 states of the United States and from 130 cities and towns in 47 foreign countries. The total registered attendance was 46,290.

A SPECIAL ISSUE OF THE JOURNAL OF THE INSTITUTE OF FUEL has been published, containing the sixteen papers which were contributed to the Symposium on Gas Temperature Measurement, which was held in December last, together with the verbatim report of the discussion following the presentation of those papers. It has been agreed by the Council of the Institute that copies of it may be obtained by the general public from the Secretary, The Institute of Fuel, 53 Victoria Street, London, S.W.1, at a price of 7s. 6d. post free.

THE DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH has issued a second and revised edition of a brief pamphlet prepared by their Forest Products Research Laboratory on the determination of moisture in timber (Moisture Content Determination, Forest Products Research Bulletin No. 14, published H.M. Stationery Office, 9d. net). The bulletin describes the usual method of finding moisture content from the initial weight of a sample of wood and its dry weight. A graph for working out the results, without resorting to tedious calculations, is provided. Distillation methods for moisture content determination and the precautions to be taken with resinous timbers are also dealt with. A section is also devoted to electrical moisture meters which depend for their action either on changes in the electrical resistance of wood with its moisture content or on the electrical capacity of the water and wood in a sample.

DURING THE MONTH of February, offers of contributions towards rent, rates and income tax were made to three industrial undertakings to induce them to set up factories in the Special Areas of England and Wales. At the end of the month, the total number of completed factories in the Team Valley Trading Estate was 100, of which 90 were occupied and in production, employing 2,310 people. On the South Wales Trading Estate at Treforest, the total number of completed factories was 42, of which 37 were occupied giving employment to 1,135 people. A further 20 factories were under construction for tenants, and negotiations for other tenancies were in progress. The Commissioner's total commitments at the end of February, in respect of all the Special Areas in England and Wales were approximately £18,235,000. The total expenditure involved, excluding the capital brought into the Areas by new firms established on the Trading Estates and elsewhere, was more than £24,000,000.

UNITED KINGDOM MANUFACTURERS (whose goods are subject to 50 per cent. customs surcharge) are finding business increasingly difficult owing to severe competition from countries which enjoy customs privileges in Ecuador, especially Germany, France and the U.S.A., states a Department of Overseas Trade report on the economic and commercial conditions in Ecuador (H.M. Stationery Office, 9d.). Local industry has, furthermore, developed considerably, and a number of laboratories established in Guayaquil are supplying a growing share of the demand for pharmaceutical specialities, patent medicines, toilet preparations, etc. Experiments are also being made by the Chemical Department of the Ecuadorean Army for the production of heavy chemicals. Imports of drugs and chemicals amounted to S/7,228,461 sucres in 1936 and to S/9,531,827 sucres in 1937. The U.S.A. supplied only U.S. $71,000 in 1937, but its share is likely to increase considerably as the result of the facilities offered by the recently concluded commercial agreement, under which a duty reduction is granted to U.S.A. imports of from S/31.70 sucres per kilo (with a minimum ad valorem duty of 15 per cent.) to a rate of S/1.20 per kilo (with no minimum). As most chemical preparations are assessed for payment of duties on an ad valorem basis rather than on one of weight, this suppression in favour of the U.S.A. will doubtless render prohibitive the sale price of United Kingdom pharmaceutical products in Ecuador.

JOSEPH CROSFIELD AND SONS, LTD., Warrington, announce that from April 1, all the firm's requirements of caustic soda will be manufactured for it and the caustic soda plant at Bank Quay, Warrington, will be closed down. This change will affect about 100 employees, but the organisation dealing with the sale of caustic soda will be continued by Joseph Crosfield and Sons, Ltd., as heretofore.

MYSORE IS THE FIRST INDIAN STATE to enforce by law the admixture of power alcohol with petrol. The Bill, passed by the Mysore Legislative Council to which the Maharaja of Mysore has now given his consent, provides for the mixture of alcohol with petrol for use as motor fuel and thus encourages the use of local materials and minimises dependence on imported supplies of motor fuel. In this way, it facilitates the profitable disposal of waste molasses, a great problem of the Indian sugar industry to-day.

THE TOTAL SHIPMENTS OF CHINA CLAY for February were 56,970 tons compared with 54,561 tons in February, 1938. Considering the great unrest on the Continent, the china clay business has been very encouraging showing even an improvement on last year. The details of the month's shipments are: Fowey, 31,196 tons of china clay; 2,020 tons of china stone; 1,444 tons of ball clay; Par, 10,964 tons of china clay; 388 tons of china stone; 20 tons of ball clay; Charlestown, 4,867 tons of china clay, 344 tons of china stone; Padstow, 350 tons of china clay; Plymouth, 332 tons of china clay; Newham, 30 tons of china clay; By rail, 5,015 tons of china clay.

COLONEL W. MONCRIEFF CARR, O.B.E., managing director of the United Kingdom Gas Corporation, in his presidential address to the Eastern District Conference of the British Commercial Gas Association, held at Bedford, said that it was essential, both from the standpoint of conserving our national mineral wealth and of providing industry with cheap supplies of efficient and easily controlled heat, that the gas industry should be protected from further advances in the price of coal. The cost of gas, he added, was dependent not only upon the cost of coal, but on the value of residual products, which values were not co-related with the price of coal by the statutory selling schemes.

AN EXHIBITION OF LEITZ APPARATUS is to be held at Kunzles Café, Union Street, Birmingham, from March 27 to 31 inclusive. It will be open daily from 10.30 a.m. to 7 p.m. and is intended to afford an opportunity to persons residing in and around Birmingham to inspect the latest models of Leitz apparatus and to bring their own specimens for demonstration and discussion. It will include instruments for both industrial and medical work; new microscopes, such as the Ortholux, as well as the standard models of E. Leitz (London), Ltd. Photomicrographic apparatus, in particular the Panphot, and measuring microscopes for industrial purposes, such as large profile projectors and toolmakers' microscope, will also be demonstrated.

THE COUNCIL OF THE PLASTICS INSTITUTE have, with the blessing of the Plastics Federation, the trade organisation of the industry, decided to promote a scheme of pupil-apprenticeship so that there will be in the future adequately trained and knowledgeable persons available to fill executive positions as and when they are required in the industry. The Institute does not propose to prescribe any definite routine of training for apprentices as this is a matter of arrangement between the employer, the apprentice and his parent or guardian, but it will not register an indenture of apprenticeship unless it is satisfied that adequate training is to be provided and that the apprentice undertakes to attend suitable educational courses. The scheme will be generally applicable to boys having a secondary school education who obtain at least three years' practical training spread over several departments of a works. Facilities will be provided also for younger boys with elementary school education taking a longer apprenticeship and obtaining the necessary standard of education by attendance at evening classes. The sections of the industry which the scheme will cover are general plastics, mould makers, mould designers and art designers. Further information can be obtained from: Apprenticeship Committee of the Institute on application to the Hon. Secretary (Apprenticeship), The Institute of the Plastics Industry, Windsor House, Victoria Street, London, S.W.1.

A FOREMAN MIXER was killed in an explosion in a powder drying shed at the Kynoch Works, Birmingham, of I.C.I. (Metals), Ltd., on Wednesday. The shed was badly damaged, but the damage was limited to the one shed.

ABERDEEN PHARMACEUTICAL ASSOCIATION, which has had a continuous existence since 1839, and which is the oldest pharmaceutical association in the kingdom, celebrated its centenary at a banquet in the Palace Hotel, Aberdeen, on March 15.

THE LEATHER WORLD has issued two wall charts indicating the rise and fall in the prices of E. I. tanned kip and skin from 1938 to 1939, and of hide from 1937 to 1939. Spaces are provided in each chart to enable the diagrams to be continued throughout 1939.

BROOKS WORKS, MICKLEHEAD GREEN, ST. HELENS, where the manufacture of " blue " was carried on for over 100 years, is being demolished. It was the first factory in the country to produce " smaltz blue " on a commercial scale and later was the first to introduce the now more popular ultramarine blue.

WHEN A STORAGE TANK BURST on March 16, 100,000 gallons of water swept through the waterproofing works of Edward Macbean and Co., Ltd., Port Dundas, Glasgow, flooded various parts of the factory and caused some damage to the stocks of Alex. Cross and Sons, Ltd. (artificial fertilisers), whose premises adjoin.

CANADA'S TOTAL CRUDE OIL PRODUCTION last year, to which Alberta contributed 97.09 per cent., was 6,944,039 barrels, a figure representing an increase in one year of 4,000,289 barrels, or one-half of the Empire's total increase of 8,087,824 barrels. In 1937 Canada's percentage of the Empire production was 7.1 per cent.; in 1938 the percentage had risen to 13.8 per cent.

OWING TO A TRANSPOSITION OF LINES in our report of The British Drug Houses, Ltd.'s exhibits at the British Industries Fair, Olympia (CHEMICAL AGE, February 25, 1939, page 148), a reference to the product Stilboestrol-B.D.H. read: " this material represents a great achievement, that of producing mineral oils to form greases." This should have read: " this material represents a great achievement, that of producing for the first time a synthetic hormone equivalent."

THE PROSPECTUS OF TATA CHEMICALS, LTD., which has now been published shows that the authorised capital of the company will be Rs.500,00,000/- divided into 250,000 preference shares of Rs.100/- each and 2,500,000 ordinary shares of Rs.10/- each. As announced (see CHEMICAL AGE, December 31, 1938, page 531; and February 4, 1939, page 81), the company has been formed for the manufacture of soda ash, caustic soda and other heavy chemicals. The company has a very influential directorate and its managing agents are Tata Sons, Ltd., Bombay House, Bruce Street, Fort, Bombay.

THE REPUTATION established in early editions by the *Guide to Business Management Books* (published by the Management Library, price 5s. 4d.), Doughty Street, London, W.C.1, is embraced by the seventh and latest edition of the volume. Its solidity has been increased by the application of boards and cloth binding and its contents have been considerably enlarged in scope. In particular, the section devoted to suggested courses of reading for staff training has been expanded. The book contains a subject index, publishers' index and authors' index in addition to reviews of books devoted to general management, accounting, production, distribution, company secretary, psychology, industrial economics, public administration and individual trades.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under " Applications for Patents " are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

FLUORESCENT PAINT.—C. Z. Holub. 7008.

PROCESS, ETC., FOR THE GENERATION OF ACETYLENE.—I. G. Farbenindustrie. (Germany, March 5, '38.) 6835.

MANUFACTURE OF MALONIC ACID DERIVATIVES.—I. G. Farbenindustrie. (Germany, March 4, '38.) 7179.

WELDING OF HARD ALLOYS to metal bodies.—I. G. Farbenindustrie. (Germany, March 7, '38.) 7380, 7381; (Germany, March 11, '38.) 7382.

METHOD OF OBTAINING ALUMINIUM from clay.—J. Lisiecki, and J. Wiercinski. (Poland, March 7, '38.) 7440.

METHOD, ETC., FOR THE TREATMENT OF CYANIDE SOLUTIONS.—Merrill Co., L. D. Mills, and T. B. Crowe. 7157.

PRODUCTION OF HORMONE PREPARATIONS.—L. Paunz, and G. Sasvári. 6868.

MANUFACTURE OF UNSATURATED KETONES, ETC.—K. W. Pepper. 7423.

ELECTRO-DEPOSITION OF NICKEL.—H. E. Potts (Udylite Corporation). 6787, 6788.

PROCESS FOR DYEING CELLULOSE ACETATE MATERIALS with direct dyes.—L. G. Ratner. 7494.

PRODUCTION, ETC., OF AN ELECTROPLATED TIN COATING on other metals, etc.—Remy, Van der Zypen, and Co. (Germany, March 7, '38.) 7326.

PROCESS OF RIPENING ALKALI CELLULOSE.—Rheinische Kunstseide, A.-G. (Germany, March 7, '38.) 7432.

PROCESS FOR TREATING TEXTILES.—M. A. T. Rogers, and Imperial Chemical Industries, Ltd. 7097, 7098, 7099.

MANUFACTURE OF β-CHLOROPROPIONIC ACID.—Rohm and Haas Ges. (Germany, March 9, '38.) 7552.

MANUFACTURE OF CONDENSATION PRODUCTS capable of hardening.—F. Rostler, and V. Mehner. (Germany, May 30, '38.) 7288.

PROCESS FOR CONCENTRATING, ETC., COLLOIDAL DISPERSIONS, ETC., in the electric field.—Semperit Oesterreichisch-Amerikanische Gummiwerke, A.-G. (Austria, March 10, '38.) 7094.

MANUFACTURE OF AZO DYESTUFFS.—Soc. of Chemical Industry in Basle. (Switzerland, March 5, '38.) 7252; (Switzerland, Feb. 17.) 7253.

FINISHING OF TEXTILE FABRICS.—W. W. Spooner. 7113.

LIQUID TREATMENT OF MATERIALS.—W. W. Spooner. 7114.

MANUFACTURE OF CATALYSTS, ETC.—Standard Oil Development Co. (United States, April 5, '38.) 7154; (United States, Aug. 12, '38.) 7155.

MANUFACTURE OF A CATALYST, ETC.—Standard Oil Development Co. (United States, April 5, '38.) 7514; (United States, Oct. 4, '38.) 7515.

SILICON CARBIDE IN ABRASIVE ARTICLES.—W. J. Tennant. (Carborundum Co.). 7571.

PRODUCTION OF CO-POLYMERIC PRODUCTS.—W. J. Tennant (Dow Chemical Co.). 7316, 7317, 7318.

PROCESS FOR THE RECOVERY OF HYDROCARBONS, ETC.—W. H. A. Thiemann (Metallges, A.-G.). 7057.

PROCESS, ETC., OF RECOVERING VOLATILE SOLVENTS from degreased articles.—A. H. Tod. 7218.

PROCESS FOR PURIFYING CARBON DISULPHIDE.—Vereinigte Glanzstoff Fabriken, A.-G. (Germany, May 10, '38.) 7065; (Germany, May 12, '38.) 7066.

WATERPROOFING COMPOSITIONS for textile materials.—J. M. Wilson. 6863

REAGENT TO FLOCULATE COAL SLURRY WATER in coal washeries.—W. Wilson. 6782.

DISTILLATION, ETC., OF LIQUID CARBONS.—T. O. Wilton. (Germany, March 8, '38.) 7575.

MANUFACTURE OF SOLUBLE AROMATIC SULPHONAMIDE COMPOUNDS. Winthrop Chemical Co., Inc. (United States, March 5, '38.) 6909; (United States, Aug. 6, '38.) 6910.

METHOD, ETC., OF REFINING OIL.—C. W. Woodworth. 7024.

EVAPORATION OF LIQUIDS.—A.-G. Kuhnle, Kopp and Kausch. (Germany, March 15, '38.) 8317.

PROCESS OF REFINING VEGETABLE, ETC., OIL.—Anderson, Clayton, and Co. (United States, March 28, '38.) 7792.

PROCESS FOR THE PURIFICATION OF WATER, ETC.—Auxiliare des Chemins de Fer et de l'Industrie, and G. V. Austerweil. (France, March 15, '38.) 7771.

HYDROLYSIS OF CELLULOSIC MATERIALS.—Chemische Fabrik Lowenberg Dr. Warth and Co. (Germany, March 21, '38.) 7715; (Germany, March 22, '38.) 7716.

MANGANESE ALLOY.—W. J. Tennant (Consolidated Mining and Smelting Co. of Canada, Ltd.). 7049.

Complete Specifications Open to Public Inspection

SOLVENT EXTRACTION OF HYDROCARBON OIL.—Standard Oil Development Co. Sept. 8, 1937. 4357/38.

MANUFACTURE OF PLASTIC COMPOSITIONS.—Standard Oil Development Co. Sept. 10, 1937. 21795/38.

DESULPHURISING MOTOR FUELS.—Gewerkschaft M. Stinnes. Sept. 8, 1937. 24109/38.

HEAT TREATMENT OF COAL, pure or mixed with other carbonaceous or non-carbonaceous materials with a view to the manufacture of agglomerates and resulting products.—Soc. Financiere de Transports et D'Entreprises Industrielles (Sofina) Soc. Anon. Sept. 7, 1937. 24548/38.

CONVERSION OF HYDROCARBON OILS.—Universal Oil Products Co. Sept. 13, 1937. 25432/38.

MANUFACTURE OF *o*-HYDROXYDISAZO DYESTUFFS.—J. R. Geigy, A.-G. Sept. 7, 1937. 25908/38.

METHOD FOR THE PRODUCTION OF OXALIC ACID by the oxidation of carbohydrates with nitric acid.—Zjednoczone Fabryki Zwiazkow Azotowych w Mosiach. Sept. 8, 1937. 25898/38.

MANUFACTURE OF SUBSTANTIVE POLYAZO DYESTUFFS.—J. R. Geigy, A.-G. Sept. 7, 1937. 25909/38.

WETTING, EMULSIFYING, CLEANING, AND WASHING AGENTS, useful especially for the treatment of textiles.—J. R. Geigy, A.-G. Sept. 7, 1937. 25910/38.

DEPOLYMERISATION OF HIGH BOILING UNSATURATED HYDROCARBONS.—I. G. Farbenindustrie. Sept. 7, 1937. 25930/38.

METHOD OF AND APPARATUS FOR DE-ACIDIFYING STAND OILS and the like.—Albert Products, Ltd. Sept. 7, 1937. 25966/38.

TREATMENT OF RUBBER and similar oxidisable materials.—United States Rubber Products, Inc. Sept. 11, 1937. 26008-9/38.

TREATMENT OF RUBBER.—United States Rubber Products, Inc. Sept. 11, 1937. 26010/38.

THICKENING-AGENTS.—H. Gossler. Sept. 7, 1937. 26022/38.

PROCESS FOR THE MANUFACTURE OF AZODYESTUFFS.—I. G. Farbenindustrie. Sept. 7, 1937. 26184/38.

PROCESS FOR THE MANUFACTURE OF AZODYESTUFFS.—I. G. Farbenindustrie. Sept. 8, 1937. 26282/38.

PROCESS FOR THE MANUFACTURE OF SULPHONIC ACID AMIDE COMPOUNDS.—I. G. Farbenindustrie. Sept. 8, 1937. 26283/38.

MANUFACTURE OF AMINO-ALCOHOL ESTERS.—E. R. Squibb and Sons. Sept. 9, 1937. 26332/38.

SYNTHETIC FATTY ACID PREPARATIONS.—Standard Oil Development Co., and I. G. Farbenindustrie. Sept. 10, 1937. 26406/38.

PRODUCTION OF MAGNESIUM.—Seri Holding Soc. Anon. Sept. 11, 1937. 26499/38.

PREPARATION OF CEMENT RAW MATERIALS.—F. L. Smidth and Co., Aktieselskab. Sept. 10, 1937. 26600, 26612/38.

MANUFACTURE OF MAGNESIUM OXYCHLORIDE BINDING-MEDIUMS and compositions.—P. J. Rouzaud. Sept. 13, 1937. 26620/38.

MANUFACTURE OF BENZIDINE.—E. I. du Pont de Nemours and Co. Sept. 11, 1937. 26635/38.

MANUFACTURE OF SYNTHETIC RUBBER-LIKE MATERIALS.—I. G. Farbenindustrie. Sept. 13, 1937. 26742/38.

MANUFACTURE OF SYNTHETIC RESINS.—I. G. Farbenindustrie. Sept. 13, 1937. 26743/38.

PROCESS FOR THE MANUFACTURE OF LACQUER RAW MATERIALS from fossil resins.—I. G. Farbenindustrie. Sept. 13, 1937. 26745/38.

PRINTING-INKS.—Interchemical Corporation. June 9, 1937. 8027/38.

Specifications Accepted with Date of Application

DYEING CELLULOSE and cellulose derivative fibrous material with acid dyestuffs.—N. E. Brookes (Färberei-A.-G. vorm. E. Stolte Nachfolger and W. Missy). Feb. 1, 1938. (Convention date not granted). 501,913.

REMOVAL OF SULPHUR DIOXIDES from gases.—Board of Trustees of the University of Illinois,. March 24, 1937. 501,840.

OBTAINING HYDROCARBONS from marine animal oils.—Eastman Kodak Co. June 12, 1936. 501,841.

PREPARATION OF IMIDINES and acylamidines and/or their tautomers.—H. E. Girling (Legal representative of H. D. Elkington (deceased)). (Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij). July 8, 1937. (Samples furnished). 501,967.

IMPROVING THE STABILITY OF LUMINOUS PAINTS.—W. W. Groves (I. G. Farbenindustrie.) Aug. 5, 1937. 502,017.

TANNING OF LEATHER.—W. W. Groves (I. G. Farbenindustrie.) Aug. 19, 1937. 502,087.

MANUFACTURE OF WATER-INSOLUBLE AZO-DYESTUFFS containing metal on the fibre.—W. W. Groves (I. G. Farbenindustrie.) Sept. 7, 1937. 502,144.

PRODUCTION OF AMINES.—Kodak, Ltd. Sept. 9, 1936. 501,927.

MANUFACTURE OF MELAMINE.—W. W. Groves (Soc. of Chemical Industry in Basle). Sept. 9, 1937. 502,148.

MANUFACTURE AND PRODUCTION OF VAT DYESTUFFS of the anthraquinone series and leuco sulphuric esters thereof.—G. W. Johnson (I. G. Farbenindustrie.) Sept. 9, 1937. 502,149.

MANUFACTURE OF ANTHRAQUINONE THIAZOLES.—E. I. du Pont de Nemours and Co., A. J. Wuertz, and W. L. Rintelman. Sept. 9, 1937. 502,037.

PROCESS FOR THE MANUFACTURE OF AMINES.—A. Carpmael (I. G. Farbenindustrie.) Sept. 10, 1937. 502,102.

MANUFACTURE OF 2-ALKYLHEXAHYDROBENZTHIAZOLES and 2-alkylhexahydrobenzselenazoles.—I. G. Farbenindustrie. Sept. 16, 1936. 502,109.

MANUFACTURE OF KETONES.—Standard Alcohol Co. Nov. 7, 1936. 501,932.

PRODUCING STABILISED MOTOR FUELS.—A. L. Mond (Universal Oil Products Co.). Sept. 14, 1937. 502,110.

AZO-DYESTUFFS.—Soc. of Chemical Industry in Basle. Nov. 16, 1936. 501,855.

PROCESS FOR THE MANUFACTURE OF CHLORIDE OF CARBON.—Consortium Fur Elektrochemische Industrie Ges. April 17, 1937. 502,061.

PROCESS FOR THE MANUFACTURE OF INSECTICIDES and fungicides. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. May 4, 1937. 501,875.

PRODUCTION OF HIGH-GRADE CELLULOSE.—Wiggins, Teape and Co. (1919), Ltd., and S. R. H. Edge. May 20, 1938. 501,999.

PROCESS FOR THE MANUFACTURE OF BRANCHED or more highly branched alkenes from non- or less-branched alkenes.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Aug. 14, 1937. 501,896.

INTRAMOLECULAR DEHYDROGENATION OF AROMATIC NUCLEI.—Soc. of Chemical Industry in Basle. July 23, 1937. (Samples furnished.) 501,897.

INSECTICIDAL COMPOSITION and method of making same.—Dow Chemical Co. Sept. 16, 1937. 501,960.

MANUFACTURE OF CONDENSATION PRODUCTS suitable for wetting, dispersing, and like purposes.—W. W. Groves (I. G. Farbenindustrie.) Aug. 6, 1937. 502,080.

Chemical and Allied Stocks and Shares

THE continued tension in international affairs resulted in a general reaction in the industrial and other sections of the Stock Exchange. At the time of writing there has been some recovery from the sharp declines shown at the beginning of the week, but prices are mostly lower on balance.

* * * *

Imperial Chemical ordinary units reacted to 28s. 10½d. immediately following publication of the past year's results. The reduction in the dividend from 8½ per cent. to 8 per cent. was in accordance with general market expectations, but sentiment was affected by the lower net profits, although the dividend payment is again conservative and enables a further large sum to be added to reserves. Distillers reacted from 93s. 9d. to 91s. and Turner and Newall declined heavily to 76s. 3d. on the view expressed in some quarters of the market, that the dividend for the past year may be reduced to 17½ per cent. Lever and Unilever, reflected the general tendency in shares with an international market and at 34s. 6d. show a decline of 2s. 6d. on balance for the week. In view of the political situation on the Continent which may affect the trade of the Dutch associated company, the market is now somewhat doubtful if the Lever and Unilever dividend will be maintained at 10 per cent.

British Oxygen moved closely in accordance with the day-to-day trend of the Stock Exchange and are lower at 72s. 6d. Murex made the lower price of 75s. 7½d. and Swedish Match were around 26s. Associated Cement were slightly better at 70s., following publication of the report and accounts, and other cement shares were inclined to show a steadier tendency. British Plaster Board were around 27s. 6d.

* * * *

Courtaulds were lower in sympathy with the general trend, although the statements at the meeting tended to confirm that the outlook for the rayon trade is improving. British Celanese issues fluctuated. The latter company is not generally expected to resume dividends on its first preference shares at this stage, but the announcement of the directors' decision, which is due next month, is awaited with interest in the market because of the possibility that a statement may also be issued as to progress in the current year to date. Pinchin Johnson at 24s. 3d. were little changed as compared with a week ago, the statements in the annual report having led to the belief that the company's profits are probably showing an upward trend. Wall Paper deferred units have reacted from 35s. to 32s. at the time of writing.

* * * *

Borax Consolidated and Fison Packard and Prentice reflected the surrounding trend of markets, and at the time of writing the last named show a decline of 1s. 3d. to 38s. 9d. United Glass Bottle transferred around 46s. 3d.; declaration of the final dividend is due shortly. Triplex Glass showed sharp fluctuations in price and United Molasses have moved down from 25s. 9d. to 23s. 3d. Iron, steel and kindred shares failed to respond to the satisfactory impression created by the full results of Baldwins and Firth & John Brown. United Steel transferred around 23s. 4½d., compared with 24s. 7½d. a week ago. British Aluminium were aided to some extent by the good results for the past year, as were Dunlop Rubber, but prices were unable to move against prevailing conditions on the Stock Exchange.

* * * *

Boots Pure Drug at 40s. 9d. show a decline of 3s. on balance, although there is continued talk of the possibility of a scrip bonus distribution later in the year. Timothy Whites and Taylors were lower at 23s. 9d., and Sangers at 21s. 3d. have lost their recent improvement. Sharp fluctuations were shown by "Shell" and other leading oil shares.

Weekly Prices of British Chemical Products

THE demand for general chemicals this week has not been particularly brisk and quiet conditions are reported from nearly all sections of the market. There has, however, been no appreciable falling off in contract deliveries and quite a steady flow of inquiry is maintained for the usual day to day items. So far as the price position is concerned there have been no important changes in values for general chemicals, rubber chemicals and wood distillation products and the undertone is firm. In the coal tar section the volume of inquiry for home trade has been on a moderate scale and there has been little improvement, if any, in the volume of export inquiry, the price position, however, remains steady.

Price Changes

Rises: Xylol, commercial.

MANCHESTER.—The Manchester market for chemical products since last report has been under the generally depressing influence of the international political situation, although there has been little actual effect on business. Deliveries of the leading heavy products against old contracts have continued on a moderate scale, with an improving tendency reported in some quarters in the movement of textile bleaching and dyeing materials. New business has been on comparatively quiet lines, however, and as before has mainly been in respect of near delivery positions. With regard to the tar products, pitch and creosote oil remain dull, and prices are on the easy side, but a fair demand is reported for a number of the light distillates at reasonably steady prices.

GLASGOW.—Since our last report there has been a steady day-to-day demand for general chemicals for home trade, but export business still remains very quiet. Prices remain firm at about previous figures, with no important changes to report, but some of the metal products are inclined to be rather dearer in sympathy with the firmer prices for metals.

General Chemicals

ACETONE.—£39 to £43 per ton, according to quantity.

ACETIC ACID.—Tech, 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 5s. 0d. per ton d/d Lancs. GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks

AMMONIUM CHLORIDE.—Grey, £17 10s. per ton, d/d U.K. Fine white, 98%, £16 per ton, d/d U.K.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8½d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £12 per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contract. SCOTLAND: £9 5s. per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4⅝d. per lb. d/d station in single 70-lb. cylinders.

CHROMETAN.—Crystals, 2⅝d. per lb.; liquor, £13 per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—9d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—11½d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0½d. per lb. MANCHESTER: 1s. 0½d. SCOTLAND: B.P. crystals, 1s. 0½d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£18 5s. per ton, less 2% in casks. MANCHESTER: £19 2s. 6d. per ton f.o.b. SCOTLAND: £19 10s. per ton, less 5%, Liverpool in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £3 10s. to £4 10s. per cwt. according to quantity; in drums, £3 2s. 6d. to £3 16s. 0d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £29 10s.; brown, £1 per ton less. MANCHESTER: White, £31; brown, £30.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£30 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. SCOTLAND: £30 per ton, less 2½% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £30 per ton, less 2½ %, carriage paid for 2-ton lots.

MAGNESITE.—Calcined, in bags, ex works, about £8 per ton. SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—Solid (ex wharf) £5 10s. per ton. SCOTLAND: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 6s. 5d. per lb.; powder B.P., 6s. 7d.; bichloride B.P. (corros. sub.), 5s. 8d.; powder B.P. 5s. 4d.; chloride B.P. (calomel), 6s. 5d.; red oxide cryst. (red precip.), 7s. 6d.; levig., 7s.; yellow oxide B.P. 6s. 10d.; persulphate white B.P.C., 6s. 7d.; sulphide black (hyd. sulph. cum. sulph. 50%), 6s. 6d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3½d. per lb.

POTASH, CAUSTIC.—Solid, £33 5s. to £38 per ton according to quantity, ex store; broken, £40 per ton. MANCHESTER: £38.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4½d. per lb. MANCHESTER: £37 per ton.

POTASSIUM DICHROMATE.—5½d. per lb. carriage paid. SCOTLAND: 5½d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 6s. 3d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9½d. to 10½d. per lb. SCOTLAND: B.P. Crystals, 10½d. MANCHESTER: B.P. 9½d. to 11½d.

POTASSIUM PRUSSIATE.—5½d. to 6d. per lb. SCOTLAND: 6¾d. net, in casks, ex store. MANCHESTER: Yellow, 6d. to 6½d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store

SALAMMONIAC.—Firsts lump, spot, £42 17s. 6d. per ton, d/d address in barrels. Dog-tooth crystals, £35 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 8s. 6d. per ton.

SODA ASH.—Light 98/100%, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, 13s. 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags in 1-ton lots. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. MANCHESTER: £10 15s.

SODIUM BISULPHITE POWDER.—60/62%, £12 10s. to £14 per ton d/d in 2-ton lots for home trade.

SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

SODIUM CHLORATE.—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.

SODIUM DICHROMATE.—Crystals cake and powder 4½d. per lb. net d/d U.K. with rebates for contracts.

SODIUM CHROMATE.—4½d. per lb. d/d U.K.
4d. per lb. GLASGOW: 4½d. net, carriage paid.

SODIUM HYPOSULPHITE.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.

SODIUM METASILICATE.—£14 5s. per ton, d/d U.K. in cwt. bags.

SODIUM NITRATE.—Refined, £8 per ton for 6-ton lots d/d. GLASGOW: £1 12s. 0d. per cwt. in 1-cwt. kegs, net, ex store.

SODIUM NITRITE.—£18 5s. per ton for ton lots.

SODIUM PERBORATE.—10%, £4 per cwt. d/d in 1-cwt. drums.

SODIUM PHOSPHATE.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £16 10s. per ton delivered per ton lots.

SODIUM PRUSSIATE.—4d. per lb. for ton lots. GLASGOW: 4d. MANCHESTER: 4¼d. to 5d.

SODIUM SILICATE.—£8 2s. 6d. per ton.

SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 10s.

SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.

SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

TARTARIC ACID.—1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1¼d. per lb. GLASGOW: 1s. 1¼d. per lb., 5%, ex store.

ZINC SULPHATE.—Tech., £11 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARYTES.—£6 to £6 10s. per ton, according to quality.

CADMIUM SULPHIDE.—3s. 0d. to 3s. 3d. per lb.

CARBON BLACK.—3⅜d. to 4 1/16d. per lb., ex store.

CARBON DISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.

CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.

CHROMIUM OXIDE.—Green, 10½d. to 11½d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

INDIA-RUBBER SUBSTITUTES.—White, 4¼d. to 5d. per lb.; dark 3⅜d. to 4⅜d. per lb.

LAMP BLACK.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.

LEAD HYPOSULPHITE.—9d. per lb.

LITHOPONE.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.

SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.

VERMILION.—Pale, or deep, 5s. per lb., 1-cwt. lots.

ZINC SULPHIDE.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1939; November, £7 8s.; December, £7 9s. 6d.; January, 1939; £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.

CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1939; November, £7 12s. 6d.; December, £7 13s. 9d.; January, 1939, £7 15s.; February, £7 16s. 3d.; March, £7 17s. 6d.; April/June, £7 18s. 9d.

NITRO CHALK.—£7 10s. 6d. per ton up to June 30, 1939.

SODIUM NITRATE.—£8 per ton for delivery up to June 30, 1939.

CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4½d. to 1s. 5d., pure 1s. 8½d. to 1s. 9d. GLASGOW: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d. MANCHESTER: Pure, 1s. 8d. to 1s. 8½d. per gal.; crude, 11½d. per gal.

CARBOLIC ACID.—Crystals, 6⅞d. to 7⅛d. per lb., small quantities would be dearer; Crude, 60's, 1s. 7½d. to 1s. 10d.; dehydrated, 2s. 6d. per gal., according to specification; Pale, 99/100%, per lb. f.o.b. in drums; crude, 2s. 1d. per gal.

CREOSOTE.—Home trade, 3½d. to 4d. per gal., f.o.r., makers' works; exports 6d. to 6½d. per gal., according to grade. MANCHESTER: 3d. to 3¾d. GLASGOW: B.S.I. Specification, 6d. to 6½d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils, 5½d. to 6¼d.

CRESYLIC ACID.—97/99%, 1s. 4d. to 1s. 7d.; 99/100%, 1s. 9d. to 2s. 6d. per gal., according to specifications; Pale, 99/100%, 1s. 6d. to 1s. 8d.; Dark, 95%, 1s. 2d. to 1s. 4d. per gal. GLASGOW: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 3s. 9d. to 4s. MANCHESTER: Pale, 99/100%, 1s. 9d. to 1s. 10d.

NAPHTHA.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1½d. to 1s. 3d. per gal., naked at works, according to quantity. MANCHESTER: 90/160%, 1s. 5d. to 1s. 7d. per gal. GLASGOW: Crude, 6½d. to 7½d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £4 10s. to £5 10s. per ton; purified crystals, £9 10s. per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £4 10s. per ton. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free). MANCHESTER: Refined, £11 to £12 per ton f.o.b.

PITCH.—Medium, soft, 30s. per ton, f.o.b. MANCHESTER: 26s. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.

PYRIDINE.—90/140%, 13s. to 13s. 6d. per gal.; 90/160%, 11s. per gal.; 90/180%, 3s. to 4s. per gal. f.o.b. GLASGOW: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. MANCHESTER: 11s. to 13s. per gallon.

TOLUOL.—90%, 1s. 11d. to 2s. per gal; pure 2s. 3d. to 2s. 4d. GLASGOW: 90% 120, 1s. 10d. to 2s. 1d. per gal. MANCHESTER: Pure, 2s. 4d. per gallon, naked.

XYLOL.—Commercial, 2s. 1d. to 2s. 2d. per gal.; pure, 2s. 3d. to 2s. 4d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £6 15s. to £9 5s. per ton; grey, £8 to £8 5s. MANCHESTER: Brown, £8 10s.; grey, £10.

METHYL ACETONE.—40.50%, £32 to £35 per ton.

WOOD CREOSOTE.—Unrefined, 6d. to 8d. per gal., according to boiling range.

WOOD NAPHTHA, MISCIBLE.—2s. 8d. to 3s. per gal.; solvent, 3s. to 3s. 5d. per gal.

WOOD TAR.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZIDINE, HCl.—2s. 7½d. per lb., 100% as base, in casks.

BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11½d. per lb. d/d buyer's works.

m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.

p-CRESOL, 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.

DICHLORANILINE.—2s. 1½d. to 2s. 5½d. per lb.

DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.

DINITROBENZENE.—7½d. per lb.

DINITROCHLORBENZENE, SOLID.—£79 5s. per ton.

DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 11d.

DIPHENYLAMINE.—Spot, 2s. 2d. per lb., d/d buyer's works.

GAMMA ACID, Spot, 4s. 4½d. per lb. 100% d/d buyer's works.

H ACID.—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.

NAPHTHIONIC ACID.—1s. 10d. per lb.

β-NAPHTHOL.—£97 per ton; flake, £94 8s. per ton.

α-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.

β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.

NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.

o-NITRANILINE.—4s. 3½d. per lb.

m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 10d. to 1s. 11d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

NITRONAPHTHALENE.—9½d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

SULPHANILIC ACID.—Spot, 8¾d. per lb. 100%, d/d buyer's works

o-TOLUIDINE.—10½d. per lb., in 8/10 cwt. drums, drums extra.

p-TOLUIDINE.—1s. 10½d. per lb., in casks.

m-XYLIDINE ACETATE.—4s. 3d. per lb., 100%.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

GRAPHITE OILS CO., LTD., Immingham Dock. (M., 25/3/39.) March 9, £3,500 debenture, to British Bitumen Emulsions, Ltd.; general charge. *£5,695. May 23, 1938.

LACRINOID PRODUCTS, LTD., Gidea Park, manufacturers and dealers in plastics and plastic materials. (M., 25/3/39.) March 4, £7,673 mortgage (sec. 81, 1929 Act), to Credit for Industry, Ltd.; charged on land and factory, etc., at Stafford Avenue, Ardleigh Green and land at junction of Stafford Avenue, and Ardleigh Green Road, Hornchurch. *£6,915. April 12, 1938.

Satisfaction

ALBERT PRODUCTS, LTD., Erith, manufacturers of resins, fibres and gums. (M.S., 25/3/39.) Satisfaction March 13, £10,000, registered October 11, 1934.

County Court Judgments

FYLDE INDUSTRIES, LTD., Brook Mill, Kirkham. (C.C., 25/3/39.) Soap manufacturers. £12 19s. 10. Feb. 7.

PALORIT PAINTS, LTD., 83 Scrubs Lane, N.W.10. (C.C., 25/3/39.) £11 7s. 10d. Dec. 13.

Company News

Gibbons and Spires, Ltd., chemical manufacturers, etc., have increased their nominal capital by the addition of £4,000 in £1 ordinary shares, beyond the registered capital of £1,000.

Eaglescliff Chemical Co., Ltd., report net profits of £7,634 for the period from March 15 to December 31, 1938. A preference dividend of 6 per cent., and an ordinary dividend of 2½ per cent. have been declared.

The Dunlop Rubber Co., Ltd., have declared a dividend of 8 per cent. and a bonus of 1 per cent. on the ordinary shares. The net profit for the year, subject to final audit, amounts to £1,500,893 (£1,591,017).

Viscose Development Co., Ltd., report for the year ended December 31 a net profit of £10,877 (£9,014). A dividend of 7 per cent. (6 per cent.) on the ordinary shares has been declared. The meeting is on March 28.

William Gossage and Sons, Ltd., a subsidiary of Lever Brothers and Unilever, Ltd., report profit for 1938 of £284,620 (£294,695). The ordinary dividend is maintained at 30 per cent. and £61,767 is carried forward (£58,397).

Joseph Crosfield and Sons, Ltd., controlled by Lever Brothers and Unilever, Ltd., show a profit for 1938 of £765,834 (£797,068). A dividend of 35 per cent. (40 per cent.) has been declared on the ordinary shares. A sum of £133,555 (£120,221) has been carried forward.

A. & F. Pears, Ltd., controlled by Lever Brothers and Unilever, Ltd., report a profit for 1938 of £91,301 (£80,925). A dividend of 20 per cent. (15 per cent.) on the ordinary shares has been declared, and £28,953 (£28,051) has been carried forward. The meeting is at Isleworth on March 30.

Cheshire United Salt have declared an interim dividend of 4 per cent., actual, less tax (3 per cent.) on the ordinary shares and an interim dividend of 4 per cent. actual, less tax (3 per cent.) on the 5 per cent. preferred ordinary shares, in addition to the fixed half-yearly dividend of 2½ per cent.

Horace Cory and Co., Ltd., chemical colour manufacturers, have announced net trading profits for 1938 of £4,780 (£4,540). A cumulative dividend of 5½ per cent. and an additional participation of 1 per cent. (same) on preference shares and a dividend of 10 per cent. on ordinary shares (same) has been declared.

Cooper, McDougall and Robertson, Ltd., report trading profits, interest, etc., of £100,071 (£159,596), contributions to pension funds, £11,063 (£12,231);; N.D.C., £496 (£2,582); income tax credit; £2,739 (£2,561); final dividend on ordinary shares, 2½ per cent., making 5 per cent. (9 per cent.), forward, £42,154 (£44,446). A meeting of shareholders will be held on March 30, for the purpose of adopting new articles of association. One of the new articles relates to the appointment of a director to be managing director by the decision of the majority of the board, in future, instead of a three-fourths majority.

United Premier Oil and Cake Co., Ltd., have declared a final dividend of 5 per cent. and a cash bonus of 2½ per cent. making, with the interim dividend paid last November, 12½ per cent. for the year (same). Net profits rose from £81,910 to £96,184.

John Knight, Ltd., report a profit for the year to December 31 of £191,835 (£239,088). A dividend of 30 per cent. on the ordinary shares (40 per cent.) has been declared and the carry-forward is £112,646 (£135,810). The company is controlled by Lever Brothers and Unilever, Ltd.

Associated Portland Cement Manufacturers report that trading profits for 1938 are £15,790 higher at £1,070,381, and income from interest and dividends amount to £590,024 (£539,361). After deducting £417,150 for depreciation and providing for debenture interest and sinking funds, net profits amount to £1,000,306, an increase of £66,078.

Imperial Chemical Industries, Ltd., report net profits for the year, after providing for obsolescence and depreciation and for tax and N.D.C., of £7,061,291 (£7,510,707). The allocation to general reserve has been reduced by £375,000, to £1,125,000, and the carry-forward is increased from £556,179 to £621,245. The directors recommend a final dividend on the ordinary stock of 5 per cent. actual, which, with the interim of 3 per cent., makes 8 per cent. for the year, compared with 8½ per cent. for 1937. Income tax will be deducted at the standard rate for 1939-40, less 4d. in the £1 in respect of Dominion tax relief. The twelfth annual meeting will be held on May 11 at Queen's Hall, Langham Place, W.1.

Forthcoming Events

London.

March 27.—Institution of the Rubber Industry. Northumberland Rooms, Northumberland Avenue, W.C.2. 7.30 p.m. Dr. R. G. R. Bacon and Dr. P. Schidrowitz, "Some Observations on the Use of Synthetic Resins in the Rubber Industry."

March 28.—Royal Institution. 21 Albemarle Street, W.1. 5.15 p.m. W. L. Bragg, "The Chemistry of the Solid State."

March 29-31.—The Chemical Society. Anniversary meetings. Royal Institution, 21 Albemarle Street, W.1.. 5 p.m. Rutherford Memorial Lecture. Sir Henry Tizard, "Lord Rutherford: His Life and Influence on Chemistry."

March 30.—Sir John Cass Technical Institute. Jewry Street, Aldgate, E.C.3. 6.30 p.m. S. Judd Lewis, "Spectroscopic Analysis."

Institute of Metals. Annual General Meeting and Open Discussion.

The Chemical Society. Burlington House, Piccadilly, W.1. 2.30 p.m. Annual General Meeting. 7.30 p.m. Grosvenor House. Anniversary Dinner.

April 3.—Society of Chemical Industry. Burlington House, Piccadilly, W.1. 8 p.m. Members' Meeting. Original papers.

April 5.—Institute of the Plastics Industry. Caxton Hall, Westminster, S.W.1. 7.30 p.m. Annual Section Meeting.

Society of Public Analysts. Burlington House, Piccadilly, W.1. 8 p.m. Meeting for reading of original papers.

Birmingham.

March 30.—Institute of Metals. James Watt Memorial Institute, Great Charles Street. 7 p.m. J. E. Hurst, "Some Observations on the Freezing of Cast Iron."

April 4.—Electrodepositors' Technical Society. James Watt Memorial Institute, Great Charles Street. 7.30 p.m. E. Downs, "Electrolytic Silver Refining."

Derby.

April 4.—British Association of Chemists. Notts and Derby Section Annual Meeting. St. James's Restaurant, Derby.

Liverpool.

March 31.—Society of Chemical Industry. Joint meeting with the Plastics Group. The University. 6 p.m. Annual Section Meeting. H. V. Potter, "In the Trail of Plastics."

Newcastle.

April 5.—Society of Chemical Industry. H. S. Priestly, "Detergents, Manufacture and Use."

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

British West Indies.—A firm of agents established at Port of Spain, Trinidad, wishes to obtain the representation of United Kingdom manufacturers of asbestos cement products. (Ref. No. 218.)

Canada.—A well-established firm of agents at Montreal wishes to obtain the representation of United Kingdom manufacturers of proprietary medicines. (Ref. No. 220.)

Switzerland.—A well-established agent at Zurich wishes to obtain the representation, on a commission basis or own account, of United Kingdom manufacturers of chemical technical products for Switzerland. (Ref. No. 230.)